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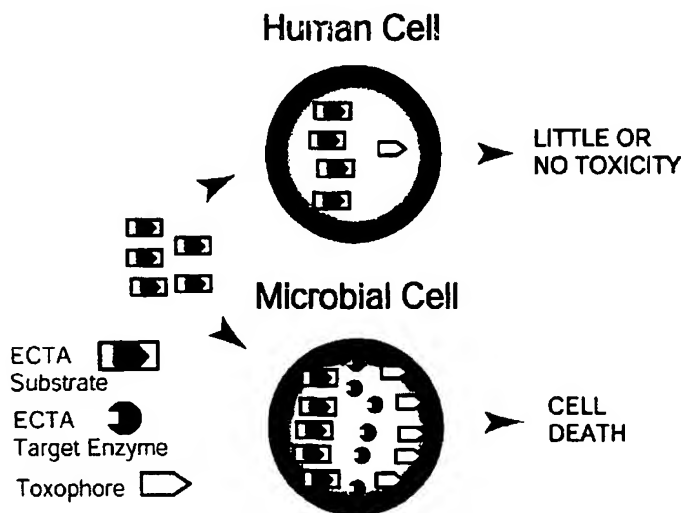
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(54) Title: METHODS FOR IDENTIFYING THERAPEUTIC TARGETS FOR TREATING INFECTIOUS DISEASE



**ENZYME CATALYZED THERAPEUTIC ACTIVATION**

*ECTA technology utilizes preferentially expressed enzymes in pathogenic organisms to generate cytotoxins.*

(57) Abstract: This invention provides methods and systems to identify enzymes that act as enzyme catalyzed therapeutic activators and the enzymes identified by these methods. Also provided by this invention are compounds activated by the enzymes as well as compositions containing these compounds.



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## **METHODS FOR IDENTIFYING THERAPEUTIC TARGETS FOR TREATING INFECTIOUS DISEASE**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

5           This application claims the benefit under 35 U.S.C. § 119(e) of U.S. provisional patent applications having the serial numbers 60/219,598; 60/244,953; and 60/276,728, filed July 20, 2000; November 1, 2000; and March 16, 2001, respectively. The contents of these applications are hereby incorporated by reference into the present disclosure.

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### **TECHNICAL FIELD**

          The present invention relates to the field of Enzyme Catalyzed Therapeutic Activation (ECTA™) therapy and in particular, ECTA therapies targeting intrinsic and unique enzymes in pathogenic microorganisms or in  
15   host cells.

### **BACKGROUND OF THE INVENTION**

          Throughout and within this disclosure, various publications, patents, published patent applications and references are identified by first author and date, within parentheses, patent number, publication number or by web  
20   address. If the complete bibliographic citation is not provided after the publication or reference, it is at the end of the specification, immediately preceding the claims. The disclosures of all publications, references and information provided at the web addresses are hereby incorporated by reference into this disclosure to more fully describe the state of the art to  
25   which this invention pertains.

          The resistance of bacterial, fungal, and viral pathogens to drug therapy has become a health issue of global concern. Similarly, the resistance of cancer cells to chemotherapy is responsible for about 600,000 deaths each year in the United States. While there are important differences that  
30   distinguish these different diseases, there are also important unifying concepts. For this reason, the introduction to this patent application will

focus on bacterial drug resistance mechanisms, and refer to common issues with other diseases as appropriate.

When antibiotics became widely available in the middle of the twentieth century (approximately 50 years ago), they were hailed as miracle drugs--magic bullets able to eliminate bacterial infection without harm to the normal cells of treated individuals. Yet with each passing decade, drug-resistant bacteria and other drug-resistant pathogens have emerged with increasing frequency. Simple bacterial and fungal infections that were once eliminated with a single drug and a simple course of therapy have become life threatening, and can be successfully treated only with drugs that display significant toxicity. Similarly, the tremendous optimism that followed initial clinical use of protease and reverse transcriptase inhibitors in the treatment of human immunodeficiency disease has now been replaced with complex cocktails of agents, and the understanding that resistant strains of virus will develop (Armstrong and Cohen (1999)).

An important reason why resistance has continued to develop at such a rapid rate, in all fields of infectious disease, is that the discovery and development of antibiotics has focused on only a few targets and a few mechanisms. By far the most common approach to discovery of anti-infectives has been the search for inhibitors of bacterial, fungal or viral enzyme functions. Antibiotics to treat the most common bacterial infections attack only a few distinct targets in the pathogen (Neu (1992)). For example, beta-lactams, penicillins, cephalosporins, monobactams, carbapenems, and penems are Class I inhibitors of bacterial cell wall synthesis. The glycopeptides vancomycin and teicoplanin are examples of Class II inhibitors of cell wall synthesis. Clindamycin, chloramphenicol, tetracyclines, and aminoglycosides are examples of known inhibitors of protein synthesis. Ciprofloxacin and ofloxacin are known inhibitors of DNA gyrase.

Each of these drugs targets an important enzyme. For difficult infections, combinations of these and other drugs are often utilized. However, the combination of drugs often works toward inhibition of separate

enzyme targets. For instance, in bacterial and sometimes fungal infections, the combination of trimethoprim and sulfamethoxazole is used to simultaneously inhibit dihydrofolate reductase and dihydropteroate synthetase, respectively. Similar approaches are used for the treatment of viral infections and cancer. In anti-HIV therapy the combination of reverse transcriptase and viral protease inhibitors is commonly employed. In treatment of breast cancer, cocktails that include a fluoropyrimidine and methotrexate, inhibitors of thymidylate synthase and dihydrofolate reductase, respectively, are often used.

It can therefore be seen that inhibitors of enzyme function are favored for the development of drug treatments in cancer and infectious disease. However, this approach has led to the emergence of drug resistant strains that render the original therapeutic ineffective. Antimicrobial agents are rendered inactive by four major mechanisms (Reviewed in Schmitz and Fluit (1999)):

(I). Enzyme mediated. This is the most common inactivation scheme observed in laboratory and clinical bacterial strains. For example, beta-lactam antibiotics work by inhibiting cell wall synthesis, specifically they inhibit penicillin binding protein. In some cases though, bacteria express a beta-lactamase enzyme which hydrolyses the antibiotics so they become inactive. Bacteria that express a beta-lactamase are often beta-lactam-antibiotic resistant. Pathogens can also enzymatically modify a therapeutic so that it cannot bind to its target (as seen with aminoglycosides and chloramphenicol). In both of the cases outlined above, an enzyme encoded by the pathogen mediates resistance.

(II). Membrane permeability. Pathogens adapt and change their cell wall (the porin structures) to prevent drug entry. This can occur in response to almost any antibacterial agent.

(III). Drug efflux pumps. Pathogens adapt and change membrane transport proteins (also an enzyme family), such that they operate with increased efficiency toward the antibiotic. This is an important mechanism of resistance to tetracycline.

(IV). Target mutation. Pathogens mutate the therapeutic target thereby preventing activation of the antibiotic. Common mutations occur in the penicillin binding protein, which prevents activation of the antibiotic.

In the hospital setting, the most recent worrisome resistance traits to emerge include plasmid-mediated resistance to imipenem and to third-generation cephalosporins among nosocomial gram-negative bacteria, and the acquisition of resistance to vancomycin by enterococci. Methicillin-resistant staphylococci continue to be a problem, with about 75% of clinical strains found to be resistant to the penicillin-related drugs, and increasingly resistant to numerous other agents. The most important resistance traits seen in community-acquired organisms include beta-lactam resistance in *Streptococcus pneumoniae* and combined ampicillin and chloramphenicol resistance in *Haemophilus influenzae*. Shigellae resistant to essentially all commonly used oral agents are also a problem, particularly in developing countries (Reviewed by Murray, B. (1997)).

While there are important differences in the exact mechanisms of drug resistance between bacterial, fungal and viral pathogens, a common theme is present throughout. Most commonly, enzyme inhibitors are selected for drug development and use in the clinic. Similarly, inhibitors of enzyme function are commonly used in the treatment of cancer (McVie (1999)). In each of these cases, drug resistance is characterized by increased enzyme expression, mutation of the target enzyme (so that it no longer recognizes the inhibitor), changes in target cell permeability and the development or overexpression of efflux pumps. There is no end in sight to the problem of drug resistance and, thus, new strategies to prevent and control resistant pathogens and tumor cells continue to be necessary.

Thus, a need exists for a novel approach to the development of anti-infective agents that overcome the drawbacks of current inhibitor-based therapeutic approaches. Various aspects of this invention satisfy this need by providing methods and systems to identify target enzymes and methods to design and assay novel therapeutic prodrugs activated by these enzymes.

## DISCLOSURE OF THE INVENTION

This invention provides a vertically integrated drug discovery program that Applicant has utilized to identify therapeutic enzyme targets and which  
5 can be used to identify prodrugs which act by a unique mechanism of action (termed "Enzyme Catalyzed Therapeutic Activation" or "ECTA"<sup>TM</sup>). In one aspect, the invention provides systems and methods to identify enzyme targets *in silico*. In alternative aspect, the invention provides a method to design potential prodrugs activated by the enzyme targets. In a yet further  
10 aspect of this invention, *in vitro* and *in vivo* assays are provided. The assays and prodrugs also are useful to test potential therapeutics. Further provided are methods to inhibit the growth of target organisms, cells, or host cells using the prodrugs of this invention. Methods to treat or alleviate the symptoms of selected diseases are further provided using the prodrugs of this  
15 invention.

In one aspect, the *in silico* methods comprise selecting from a suitable database an enzyme or list of enzymes expressed by a target organism, by an infectious agent or in an infected host cell, or by or in a pathological cell. The results of this search are compared against a search of expressed  
20 enzymes in or by a suitable control. The method selects for enzymes expressed in one cell type or organism but not in another. Various embodiments of this aspect are provided herein. For example, one embodiment identifies enzymes expressed by a pathogen or on in a pathogen-infected cell but not expressed in the host or uninfected host cell.

25 These methods identified and will identify enzymes that are targets ("target enzymes") for a novel ECTA approach to treat a variety of diseases including bacterial, fungal, parasitic and viral infections. In contrast, conventional therapies rely on the use of inhibitors of enzymes critical for target viability and/or proliferation. Consistent with Applicant's ECTA  
30 approach, the prodrug compounds of this invention do not act as enzyme inhibitors but undergo enzyme catalyzed transformation by target enzymes

resulting in the generation of cytotoxic reaction product(s). The formation of cytotoxic species is achieved by engineering unique substrates (ECTA prodrugs or compounds) which are transformed into toxins by the target enzymes.

5           In one aspect, the target enzymes of this invention are pathogen-specific enzymes that are only expressed by pathogens, e.g., bacterial and fungal pathogens or in virally infected cells. In cases of intracellular parasites or viruses, host cell enzymes induced by the pathogen or infectious agent, or enzymes specifically encoded by the pathogen or infectious agent,  
10           were targeted and can be targeted in further embodiments of this invention.

          The pharmaceutical and agricultural industries have focused on development of inhibitors of selected target enzymes for the development of anti-infectives, insecticides and herbicides (Shaner and Singh (1997) and Papamichael (1999)). This approach has suffered from several issues: (1) the  
15           presence of salvage pathways which allow specific enzyme inhibition to be circumvented; (2) mutation of the enzyme so that it no longer binds inhibitor, but can still metabolize substrate; and (3) inhibitor-associated enzyme overexpression leading to resistance.

          The use of enzyme inhibitors for treatment can often result in harmful  
20           and uncomfortable side effects. For example, protease inhibitors used in HIV treatment have been shown to affect glucose control, lipid metabolism, and body fat distribution (Mulligan (2000)).

          This invention defines a new ECTA approach that targets intrinsic enzymes ("iECTA" approach) which overcomes the limitations and problems  
25           associated with prior art therapies. Applicant's approach is distinguished from prior approaches because iECTA enzymes are NOT endogenous enzymes for the host cell and are not necessarily related to drug resistance. In other words, only pathogens or pathogen-infected cells express the iECTA enzymes. The prodrug compounds which are designed to be selectively  
30           activated by the iECTA enzymes also avoid side effects by achieving alternative, more selective therapies that preferentially affect diseased cells

with little or no effect on healthy tissue. To the best of Applicant's knowledge, this approach has not been described or utilized previously. Therapeutics designed and generated using iECTA technology supplement and complement present day enzyme inhibitor-based treatments.

5           The present method can be applied to identify target enzymes other than iECTA enzymes by searching a first suitable data structure (database) to obtain a first set of information relating to one or more enzymes associated with a target organism. In certain embodiments, the enzyme is overexpressed or selectively expressed as compared to a control counterpart.

10       A search also is conducted on one or more other suitable data structures (databases) to obtain one or more additional sets of information relating to one or more expressed enzymes associated with one or more additional class of organisms or by the same organism growing under in a different environment or in a different host. The first set of information is compared

15       to the one or more additional sets of information to identify enzymes in the first set of information that are not present in the one or more additional sets of information. These identified enzymes are targets for ECTA compounds.

          This invention further provides ECTA prodrugs. While each prodrug is selectively activated by a specific target enzyme counterpart, there are

20       some general features of ECTA prodrugs. Figures 2A and 2B describe general characteristics of ECTA prodrugs that distinguish them from conventional therapeutics. One feature of an ECTA enzyme/ECTA compound combination is the absence of irreversible inhibition or inactivation of the target enzyme by the ECTA compound, intermediates or

25       products of the reaction. In some embodiments, it is preferred but not necessary, that the ECTA target enzyme be critical for disease progression. This property means that resistance to iECTA compounds, which could result from disease/loss of target enzyme expression, may also result in decreased pathogenicity. To the best of Applicant's knowledge, this approach has not

30       been previously described or utilized.

Also provided is a method for the design of iECTA compounds or prodrugs which are selectively activated by yet to be identified iECTA enzymes using the methods of this invention. This invention further provides iECTA compounds or prodrugs activated by infectious agents or in host cells, e.g., the enzymes listed in Figure 7A and 7B and their biological equivalents. As used herein, and unless specifically excluded, Applicants intend for the biological equivalents of the iECTA compounds to be included in each embodiment of the invention. A "biological equivalent" is defined *infra*.

The iECTA compounds are provided alone or in combination with a liquid or solid carrier. Compositions comprising at least one iECTA compound or its biological equivalent in combination with an additional therapeutic is further provided by this invention.

Also provided is an assay for an iECTA compound that selectively inhibits the growth of an infectious agent in a target cell or an infected cell. The iECTA prodrug is contacted with its target enzyme in a cell-free system under suitable conditions. Activation by the target enzyme is monitored by methods well known in the art.

An *in vitro* screen is further provided by this invention. The iECTA enzyme is contacted with a pathogen or host cell containing or expressing the target enzyme. In one embodiment, the host cell and the prodrug are contacted under conditions that favor incorporation of the compound into the host cell. The pathogens or host cells are assayed for inhibition of growth or killing of the infectious agent or the host cell. Control systems and/or cells can be contacted with the prodrug and assayed.

This invention also provides a method for inhibiting the growth or proliferation of an infectious agent or a host cell by contacting the infectious agent or host cell with an effective amount of an ECTA prodrug, e.g., an iECTA prodrug.

A method for determining whether a subject will be suitably treated by an ECTA prodrug such as an iECTA prodrug is provided by this invention. As an example, an iECTA compound is delivered to an infected cell under



suitable conditions such that the growth of the infectious agent or infected cell is inhibited or the agent is killed.

Various modifications of the above methods are within the scope of this invention. For example, a different and/or additional enzyme target can be  
5 assayed against the same iECTA prodrug or a different and/or additional prodrug can be assayed against the same target enzyme. Prior art therapeutics or therapeutic methods can be combined with the use of the iECTA prodrugs to enhance or modify the biological activity of the iECTA prodrug. These methods can also be modified by varying the amount of the iECTA prodrug  
10 and/or additional therapeutic or alternatively or in combination, the order of the prodrugs and/or therapies can be modified, e.g., simultaneous or sequential. The sequential order can further be modified. These methods are further modified for prophylactic use.

A kit for determining whether a pathogen or pathogen-infected cell will  
15 be suitably treated by an iECTA therapy is also provided by this invention. The kit comprises an effective amount of at least one compound of this invention and instructions for use.

As is apparent to those of skill in the art, the above iECTA methods can be modified for application in other ECTA systems. These systems are  
20 described in more detail below.

### BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows how ECTA technology preferentially targets selected cells.

25 Figures 2A and 2B are the process for successful identification of one embodiment of this invention, the identification of iECTA target enzymes and iECTA compounds.

Figure 2C is a flowchart for a process for identifying enzymes for designing ECTA compounds in accordance with an embodiment of the  
30 present invention.

Figure 2D is a schematic diagram of an illustrative system capable of executing the process for identifying enzymes for designing ECTA compounds set forth in Figure 2C in accordance with an embodiment of the present invention.

5        Figure 3 shows the results of one embodiment of the method of this invention that utilizes tBLAST alignment for the identification of a "favorable reaction type" iECTA. Shown in the figure is a tBLAST alignment of *Pseudomonas aeruginosa* acetolactate synthase large subunit amino acid sequence with the human expressed sequence tag database  
10 (translated in all six possible reading frames). The low "Expect" (E) values indicate that it is extremely unlikely that any of these alignments could occur by chance alone. Only the ten best E values and the best alignment are shown.

Figure 4 shows the results of one embodiment of the method of this  
15 invention that utilizes tBLAST alignment for the identification of a "favorable reaction type" iECTA. Shown in the figure is a tBLAST alignment of *Pseudomonas aeruginosa* acetolactate synthase small subunit amino acid sequence with the human expressed sequence tag database (translated in all six possible reading frames). E values = 6.5 indicating that  
20 the alignment shown would be predicted to be found more than six times in the expressed tag database due to chance alone.

Figure 5 is a proposed mechanism of AcLS ECTA.

Figure 6 is a comparison of 2-oxobutyrate metabolism in humans and *E. coli*.

25        Figure 7A is a list of the Enzyme Commission Numbers representing intrinsic and unique enzymes for the following organisms:

1. "Yersinia pseudotuberculosis"
2. "Yersinia pestis"
- 30 3. "Vibrio cholerae El Tor N16961"
4. "Ureaplasma urealyticum"
5. "Treponema pallidum"
6. "Streptomyces coelicolor"

7. "Streptomyces coelicolor"
8. "Streptococcus pyogenes"
9. "Streptococcus pneumonia"
10. "Streptococcus mutans"
- 5 11. "Streptococcus equi"
12. "Staphylococcus aureus"
13. "Salmonella typhimurium"
14. "Salmonella typhi"
15. "Salmonella paratyphi"
- 10 16. "Salmonella enteritidis"
17. "Salmonella dublin"
18. "Saccharomyces cerevisia"
19. "Rickettsia prowazekii"
20. "Pseudomonas aeruginosa"
- 15 21. "Porphyromonas gingivalis"
22. "Pasteurella multocida"
23. "Neurospora crassa"
24. "Neisseria meningitidis ser. B "
25. "Neisseria meningitidis ser. A "
- 20 26. "Neisseria gonorrhoeae"
27. "Mycoplasma pneumoniae"
28. "Mycoplasma genitalium"
29. "Mycobacterium tuberculosis"
30. "Mycobacterium leprae"
- 25 31. "Mycobacterium bovis"
32. "Klebsiella pneumoniae"
33. "Helicobacter pylori"
34. "Helicobacter pylori J99"
35. "Haemophilus influenzae"
- 30 36. "Haemophilus ducreyi"
37. "Escherichia coli"
38. "Enterococcus faecium (DOE)"
39. "Enterococcus faecalis"
40. "Corynebacterium diphthe"
- 35 41. "Clostridium difficile"
42. "Clostridium acetobutyli"
43. "Chlamydia trachomatis D"
44. " Chlamydia trachomatis M"
45. "Chlamydia pneumoniae AR39"
- 40 46. "Chlamydia pneumoniae CWL029"
47. "Campylobacter jejuni"
48. "Borrelia burgdorferi"
49. "Bordetella pertussis"
50. "Bordetella bronchiseptica"
- 45 51. "Bacillus subtilis"

Figure 7B is an abbreviated list consisting of all the EC number descriptions, but listing only one occurrence for each organism and consists of the 673 enzymes.

Figure 8 illustrates an illustrative system with a plurality of components in accordance with one embodiment of the present invention.

Figure 9 illustrates a representative hardware environment in accordance with one embodiment of the present invention.

Figure 10 shows chemical structures representative of different chemical classes of AcLS inhibitors currently used as herbicides.

Figure 11 shows the synthetic pathway for valine and leucine.

Figure 12 shows the synthetic pathway for isoleucine.

### MODES FOR CARRYING OUT THE INVENTION

The practice of the present invention will employ, unless otherwise indicated, conventional techniques of modern biology and chemistry, including but not limited to molecular biology, biochemistry, microbiology, cell biology, enzymology, organic synthesis, medicinal chemistry, which are within the skill of the art. See, *e.g.*, Sambrook, et al. Molecular Cloning: A Laboratory Manual, 2<sup>nd</sup> edition (1989); Current Protocols In Molecular Biology (F. M. Ausubel, et al. eds., (1987)); the series Methods In Enzymology (Academic Press, Inc.): PCR 2: A Practical Approach (M.J. MacPherson, B.D. Hames and G.R. Taylor eds. (1995)); Animal Cell Culture (R.I. Freshney, ed. (1987)); and J. March, Advanced Organic Chemistry: Reactions, Mechanisms And Structure, 4<sup>th</sup> edition (John Wiley & Sons, NY (1992)).

As used in the specification and claims, the singular form “a”, “an” and “the” include plural references unless the context clearly dictates otherwise. For example, the term “a cell” includes a plurality of cells, including mixtures thereof.

The term “comprising” is intended to mean that the compositions and methods include the recited elements, but do not exclude others. “Consisting

essentially of” when used to define compositions and methods, shall mean excluding other elements of any essential significance to the combination. Thus, a composition consisting essentially of the elements as defined herein would not exclude trace contaminants from the isolation and purification method and pharmaceutically acceptable carriers, such as phosphate buffered saline, preservatives, and the like. “Consisting of” shall mean excluding more than trace elements of other ingredients and substantial method steps for administering the compositions of this invention. Embodiments defined by each of these transition terms are within the scope of this invention.

10       An “infectious agent” is intended to be synonymous with “pathogen” and includes, but is not limited to bacteria, parasites, rickettsia, virus, and fungus.

Any of the terms “toxin”, “toxoid”, “prototoxophore”, “toxophore”, “Tox”, or “TOX” are synonymous and intend any molecule or functional group that is released or unmasked (revealed) upon the action of the enzyme resulting in toxicity to the pathogen, pathological cell or in an infected host cell. As apparent to those of skill in the art, the toxin or toxoid will vary with the target enzyme, the pathogen, the host cell and the subject being treated. Examples of toxins include, but are not limited to anthracyclins, vinca alkaloids, mitomycins, bleomycins, penicillins, cephalosporins, oxacillins, carbopenems, tetracyclins, chloramphenicols, macrolides, cycloserines, fluoroquinolones, glycopeptides, aminoglycosides, peptide antibiotics, oxazolidinones, quinolones, sulfonamides, cytotoxic nucleosides, pteridine family, nitrogen mustards, polyhalogenated biphenyls, diynes, podophyllotoxins, taxoids, alkylating agents. Some of the useful representatives of these classes include doxorubicin, carminomycin, daunorubicin, aminopterin, methotrexate, methopterin, dichloromethotrexate, mitomycin C, porfiromycin, 5-fluorouracil, 6-mercaptopurine, cytosine arabinoside, podophyllotoxin, etoposide, etoposide phosphate, melphalan, vindesine, vinblastine, vincristine, leurosine, leurosine, bis-(2-chloroethyl)amine, trichlorcarban, trichlorocarbanilide,

tribromosalicylanilide, sulphamethoxazole, chloramphenicol, cycloserine, trimethoprim, chlorhexidine, hexachlorophene, fentichlor, 5-chloro-2-(2,4-dichlorophenoxy)phenol, 4-chloro-2-(2,4-dichlorophenoxy)phenol, 3-chloro-2-(2,4-dichlorophenoxy)phenol, 6-chloro-2-(2,4-dichlorophenoxy)phenol, 5-chloro-2-(3,4-dichlorophenoxy)phenol, 5-chloro-2-(2,5-dichlorophenoxy)phenol, 5-chloro-2-(3,5-dichlorophenoxy)phenol, 2,2'-dihydroxy biphenyl ether, halogenated 2-hydroxybenzophenones, 2-mercaptopyridine-N-oxide, combretastatin, camptothecin, apoptolidine, cisplatin, epothilone, halichondrin, hemiasterlin, methioprim, thapsigargin, chloroquine, 4-hydroxycyclophosphamide, etoposide, colchicine, melphalan, quercetin, genistein, erastatin, N-(4-aminobutyl)-5-chloro-2-naphthalen-sulfonamide, pyridinyloxazol-2-one, isoquinolyloxazolone-2-one, verapamil, quinine, quinidine, chloroquine, 2-halo ketones, nitrosoureas and reactive byproducts, epoxides, bromonium ions, aziridinium ions. Functional groups that are unmasked or revealed include the conversion of vinyl halides to allyl halides as in NB1011 (discussed *infra*).

A "prodrug" is a precursor or derivative form of a pharmaceutically active agent or substance that is less cytotoxic to target or hyperproliferative cells as compared to the drug metabolite and is capable of being enzymatically activated or converted into the more active form (see Connors, T.A. (1986) and Connors, T.A. (1996)). The toxicity of the agent is directed to cells that are producing the converting enzyme in an amount effective to produce a therapeutic concentration of the cellular toxin in the diseased cell.

A "composition" is intended to mean a combination of active agent and another compound or composition, inert (for example, a detectable agent or label or a pharmaceutically acceptable carrier) or active, such as an adjuvant.

A "pharmaceutical composition" is intended to include the combination of an active agent with a carrier, inert or active, making the composition suitable for diagnostic or therapeutic use *in vitro*, *in vivo* or *ex vivo*.

As used herein, the term “pharmaceutically acceptable carrier” encompasses any of the standard pharmaceutical carriers, such as a phosphate buffered saline solution, water, and emulsions, such as an oil/water or water/oil emulsion, and various types of wetting agents. The compositions also can include stabilizers and preservatives. For examples of carriers, stabilizers and adjuvants, see Martin, Remington’s Pharm. Sci., 15th Ed. (Mack Publ. Co., Easton (1975)).

An “effective amount” is an amount sufficient to effect beneficial or desired results. An effective amount can be administered in one or more administrations, applications or dosages. The term “effective amount” is to include therapeutically or prophylactically effective amounts. Thus, the term also refers to an amount effective in treating or preventing an infection in a patient or an infestation in a plant either as monotherapy or in combination with other agents.

The term “prophylactically effective amount” refers to an amount effective in preventing infection in a subject or plant infestation.

The term “linker” indicates a spacer or connector between two parts of a single molecule such that when a particular bond is severed between the two parts of the molecule separate.

“Inhibiting the growth” of a microorganism or infected cell means reducing by contact with an agent, the rate of proliferation of such a microorganism or infected cell, in comparison with a control microorganism of the same species not contacted with this agent or as compared to an uninfected cell.

The term “treating” refers to any of the following: the alleviation of symptoms of a particular disorder in a patient; the improvement of an ascertainable measurement associated with a particular disorder; or a reduction in microbial number. One of skill in the art can determine when a host has been “treated” by noting a reduction in microbial load or an alleviation in symptoms associated with infection.

A “subject,” “individual” or “patient” or “host” is used interchangeably herein and refers to plants, avians, fish and animals, e.g., a vertebrate, preferably a mammal, more preferably a human. Mammals include, but are not limited to, murines, simians, humans, farm animals, sport animals, and pets.

A “control” is an alternative subject or sample used in an experiment for comparison purpose. A control can be “positive” or “negative”. As known to those of skill in the art, a “suitable control” is variable and depends in part on one or more of the following criteria: the target pathogen, the target enzyme, expression level of the target enzyme, the host cell, the subject or host as well as the specific genotype or phenotype of each. For example, when the object of the method is to identify target enzymes in pathological cells such as cancer, a suitable control can be one or more of a normal counterpart cell, a counterpart cancer cell that has not undergone any therapy or been exposed to an inducing agent or a different therapy or a cell that has been treated in a different environment or microenvironment, e.g., *in vitro* versus *in vivo*. Alternatively, the control cell can be one that been or will be treated with a known therapeutic or therapeutic method. When the object of the invention is to identify intrinsic ECTA target enzymes expressed by pathogens or in pathogen-infected cells, the control counterpart can be one or more of a pathogen that has not been exposed to an inducing agent or one that is not infected with the pathogen.

An “inducing agent” includes any agent (chemical, physical or mechanical) which alters the genotype or phenotype of a pathological cell or infectious agent or infected cell. Examples include prior chemotherapy (in the case of cancer), prior treatment with one or more antibiotics (in the case of pathogens and pathogen-infected cells) or prior exposure to another organism resulting in the exchange of genetic material, e.g. plasmids that confer antibiotic resistance to a host cell. Additional examples include, but are not limited to exposure to radiation, chemicals, ultra-violet light, metals or genetic manipulation.



As used herein, “expressed at elevated levels” in the context of infectious disease, is intended to include any amount over the base line or control as compared with host cells (e.g., an uninfected or normal cell) taking into consideration the sensitivity of the detection system and statistical variation in the computation methods. In the context of cancer, “expressed at elevated levels” is intended to include any amount that is more than an amount over the base line or control (e.g., a normal counterpart cell) taking into consideration the sensitivity of the detection system and statistical variation in the computation methods. In some aspect, it is at least 2X, or more than 3X or preferably more than 4X than that expressed in a normal cell.

A “favorable reaction type” as used herein, refers to a chemical reaction catalyzed by an enzyme wherein an enzyme that catalyzes such a reaction has been shown to be effective at metabolizing ECTA substrates.

As used herein, the terms “pathological cells”, “target cells”, “host cells” and “hyperproliferative cells” in the context of cancer, encompass cells characterized by the activation by genetic mutation or the endogenous overexpression of an intracellular enzyme which may confer resistance to the inhibitory or cytotoxic effects of chemotherapy. Overexpression of the enzyme can be related to loss of tumor suppressor gene product function drug resistance or the genetic instability associated with a pathological phenotype. In the context of infectious agents, the terms encompass cells infected with or containing an infectious agent as defined herein. In the context of cells and infectious agents showing resistance to antibiotics, the terms encompass cells overexpressing an enzyme which confers resistance to the cytotoxic effects of the antibiotic.

“Sequence comparison” is used to compare character strings representing proteins or fragments of DNA to gather evidence for common function or biological origin. Proteins which are thought to have a common ancestor are called homologous. The process of evolution introduces mutations in DNA which may take the form of: the substitution of one or

more nucleic acids for another; the deletion of one or more nucleic acids; or the insertion of one or more nucleic acids.

These changes in the genetic material of organisms can lead to corresponding changes in the amino acid sequences for the corresponding proteins. Close “homologs” tend to share substantial portions of their amino acid sequences, and so sequence comparison algorithms are used as a tool to detect homologies. It is, however, by no means a foolproof tool: there are examples of proteins that have substantial sequence similarity but serve very different functions and exhibit different three-dimensional structures, and so are probably not homologs. On the other hand, there are proteins with very little sequence similarity but which nonetheless have similar functions and three-dimensional structures, and are considered homologs.

A biological sequence is a finite string of characters drawn from some alphabet. Typically these strings will represent amino acid sequences (proteins; alphabet size = 20) or nucleic acid sequences (DNA; alphabet size = 4). We write  $s[i]$  for the  $i$ th character of  $s$ , where  $i$  is between 1 and  $|s|$ , the length of  $s$ .

An “alignment” of two strings  $s$  and  $t$  on the same alphabet  $A$  is a pair of strings  $s'$  and  $t'$  on the alphabet  $A + \{-\} =: A'$ , where  $-$  is a special character not in  $A$  that represents a “gap” or “space”, such that

- $|s'| = |t'|$ ;
- removing all the  $-$  characters from  $s'$  leaves  $s$ , and similarly for  $t'$  and  $t$ ; and
- gaps are never paired with gaps; that is, if  $s'[i] = -$  then we do not have  $t'[i] = -$ , and *vice-versa*.
- The goal of pairwise sequence alignment algorithms is to find a high-scoring alignment of a given pair of sequences (or subsequences of those sequences), according to some prescribed alignment scoring method.

“Classic dynamic programming algorithms” are thought of as *exact*, in the sense that they are guaranteed to compute the best possible alignment of

the two strings under the supported alignment scoring system. The scoring systems usually prescribes a method of scoring character pairings, and the total score for a particular alignment is the sum of the character pair scores. A scoring function  $S: A' \times A' \rightarrow R$  is symmetric in its two arguments.

- 5 Typically, character matches are awarded positive scores, and mismatches may be assigned different scores depending on the severity of the mismatch (for example, two amino acids that have similar chemical properties may be substituted for one another without greatly affecting the function of the resulting protein, and matching one with the other may be almost as good as
- 10 a perfect match and be awarded a positive score. On the other hand, two amino acids may have very different chemical properties and their mismatch may be awarded a negative score). Gaps are usually awarded negative scores. In the simplest case, the penalty for a gap in the completed alignment is proportional to its length, and the scoring function may be represented as a
- 15 symmetric matrix. However, there are biological reasons for penalizing small gaps more heavily than larger ones, and popular implementations usually use *affine* gap penalties of the form  $I + R*(k-1)$  for a gap of length  $k$ ; this requires a minor change in representation for the scoring function.

- These algorithms proceed by constructing a  $(|t|+1)*(|s|+1)$  matrix  $M$
- 20 of partial alignment scores, frequently called the “dynamic programming matrix”.  $M[i,j]$  is interpreted as the score of the best alignment of the subsequences  $t[1..i]$  and  $s[1..j]$  that ends by pairing  $t[i]$  with  $s[j]$ . The zeroth column and row represent leading gaps, and are assigned negative scores according to the gap scoring regimen. The fundamental notion in all these
- 25 algorithms is that the value of  $M[i,j]$  must be the best (maximum) of

$$\begin{aligned} M[i,j-1] + S['-',j] & \text{ pair a gap in } t' \text{ with } s[j] \\ M[i-1,j-1] + S[i,j] & \text{ pair } t[i] \text{ with } s[j] \\ M[i-1,j] + S[i,'-'] & \text{ pair } t[i] \text{ with a gap in } s' \end{aligned}$$

assuming that  $M[i-1,j]$ ,  $M[i-1,j-1]$  and  $M[i,j-1]$  are all previously computed.

A highest-scoring alignment can then be recovered from the matrix  $M$  by using a “traceback procedure”. Tracing back from element  $M[i,j]$

involves recomputing the scores for the extensions of prefix alignments as above, then selecting one that equals  $M[i,j]$ , and then tracing back from the corresponding element  $M[i-1,j]$ ,  $M[i-1,j-1]$ , or  $M[i,j-1]$  (Of course, it could be that two or all three of the prefix alignments lead to the same score; in this case, there is usually some policy on selecting one type of alignment over another. It is also possible to maintain a list of equivalent alignments and report all of the best-scoring alignments). The traceback starts at the maximum element in the last row together with the last column of  $M$ , and ends when the zeroth row or column is reached.

- 10       The algorithm described above is similar to the Needleman-Wunsch global alignment algorithm. The algorithm is called a “global” alignment algorithm because it tries to find the best alignment over the whole strings  $s$  and  $t$ . With a slight change, the same technique can be used to find the best *local* alignment between  $s$  and  $t$ , that is, the highest-scoring (global)
- 15       alignment of substrings  $s[i_1..i_2]$  and  $t[j_1..j_2]$ . The changes required are:
- the zeroth row and column are initialized with zeros;
  - in the dynamic programming computation, let  $M[i,j]$  be the maximum of the given quantities above together with zero.
  - in the traceback procedure, start at the maximum element for
- 20       the entire dynamic programming matrix, and stop as soon as an  $M[i,j] = 0$  is encountered.

This is the Smith-Waterman local alignment algorithm. Of the classic dynamic programming methods, it is the most commonly used.

- 25       For biological reasons one may wish to not penalize gaps that occur at the beginning or end of an alignment. These variations are easily accommodated by changing the initialization of the zeroth row and column of  $M$ .

- 30       The classic algorithm as presented requires  $O(|s| * |t|)$  (quadratic) time and space. The matrix  $M$  is normally filled in row-by-row or column-by-column, and it is never necessary to have more than two rows or columns of

the matrix in memory at once. In many applications, the actual alignment may not be necessary, and only the maximum score over all possible alignments may be required. In this case, we need not store  $M$  but instead store only those rows (columns) necessary for the computation and the  
 5 maximum value. In this case the algorithm uses only linear ( $O(\min(|s|, |t|))$ ) space.

It is however possible to recover the optimal alignment using only linear space, at the expense of doubling the computation time. The fundamental idea is to use a divide-and-conquer approach and recompute  
 10 parts of the dynamic programming matrix (actually, maximum values over rectangular subregions of it) as required.

The "FAST" algorithm is a heuristic approach that tries to approximate the best (local) alignment and score while reducing the computational expense of the Smith-Waterman algorithm. Strictly speaking,  
 15 it is a database search algorithm: we have a *query string*  $q$ , and wish to compare it against every string in a database of strings. Typically, it is best to report the best  $n$  scores and corresponding alignments, where  $n$  is much smaller than the database size. The computation for each database string  $s$  is a local alignment with  $q$ , and proceeds in four stages:

- 20        1)    the strings are rapidly scanned for exact substring matches of length  $ktup$ .  $ktup$  is usually quite small, only 1 or 2. A table of  $|q| + |s| - 1$  counters is maintained, one for each diagonal in a table, similar to the dynamic programming matrix  $M$ ; for a match of a  
 25             $k$ -tuple with starting points  $q[i]$  and  $s[j]$ , the  $i$ - $j$ th counter is incremented. At the end of this stage, the table of counters gives the number of *hits* for each diagonal.
- 2)    for each diagonal with more than one hit, hits are merged into *regions*. These regions may contain mismatches, but since everything is in the same diagonal, there are no gaps.
- 30        3)    the five best regions are rescored using a protein substitution matrix (for example, PAM120, PAM250, or, more recently, a

BLOSUM matrix). The best of these scores is reported for the sequence pair, and is called the *initial score*. The matches in the database are ranked according to their initial scores.

- 5           4) the pairs with the  $n$  best initial scores are then re-examined using a modified Smith-Waterman alignment algorithm that is restricted to a band 64 diagonals wide centered around the best diagonal. This new score is called the *optimized score*. In reporting the final results, both initial and optimized scores are listed; often very good matches have a dramatically better  
10           optimized score than the initial score.

The FAST package includes a program for testing the statistical significance of high-scoring matches. It works by scrambling one of the strings and running the Smith-Waterman algorithm on the new pair; this is repeated many times. If the score reported for the original pair is sufficiently  
15 far from the mean score for the alignments on the scrambled strings, the match is considered significant (unlikely to be due to chance). Recent versions of FASTA evaluate the statistical significance of scores using a theory based on extreme value distributions.

Like FAST, BLAST (*Basic Local Alignment Search Tool*) is another  
20 heuristic database search algorithm that tries to reduce the time required to find good pairwise alignments. Like FAST, BLAST attempts to find high-scoring subsequences with no gaps, but its approach is a little different. Given a query protein sequence  $q$  and a database sequence  $s$ , BLAST:

- 25           1. examines the query sequence to find high-scoring substrings or *words* for matches. There are two parameters that affect the search for these words: a word length  $w$  and a threshold score  $T$ . The algorithm constructs the set of all  $w$ -length contiguous subsequences ( $w$ -mers) of the query  $q$ , and then for each  $w$ -mer  $d$  finds all possible  $w$ -mers that score at least  $T$  when compared  
30 with  $d$  using a protein substitution matrix (usually PAM, or, more recently, BLOSUM). Not all  $w$ -mers from  $q$  need

- contribute to the word list: if a word  $d$  scores less than  $T$  when compared with itself, it will not contribute at all;
2. scans the database using a hashtable or specially-constructed DFA for exact matches to entries in the word list (*hits*); and
  - 5 3. extends hits. A hit is extended by adding characters to the front and back of each of the two substrings until a maximal score (under the same substitution matrix as above) is reached: dropping or adding a pair of characters at either end lessens the score. In practice, the pair is discarded if the score falls a
  - 10 prescribed distance below the best score reported for the same-length extension so far.

The best extension scores (or *maximal segment pair (MSP)* scores) are used to rank the database strings. The process for DNA is similar, except that the scoring is simpler (there are no substitution matrices), and the values

15 of the parameters are different.

BLAST attempts to estimate the statistical significance of the MSP scores based on a statistical theory of how MSP scores should be distributed for random strings.

## 20 **Identification of ECTA Target Enzymes -Methods and Systems**

A method is provided that identifies ECTA enzymes. A first suitable data structure is searched to obtain a first set of information relating to one or more enzymes associated with a target organism. The enzyme can be one that is expressed, overexpressed or selectively expressed. This search

25 provides a first enzyme list. A search also is conducted on one or more other suitable data structures to obtain one or more additional sets of information relating to one or more expressed enzymes associated with one or more controls. The first set of information is compared to the one or more additional sets of information to identify enzymes in the first set of

30 information that are not present (or absent) in the first search, but not the second. These identified enzymes are targets for ECTA compounds.

Examples of data structures include, but are not limited to databases of genetic or expressed genetic information relating to enzymes. The information may be in the form of DNA, RNA or protein and may include, where appropriate information relating to quantitative expression of the enzyme. The information may be organized in any manner. In one aspect, the information is restricted to the pathogen or host cell expressing it. In another aspect, the information is organized by tissue distribution, e.g., enzymes expressed in cancer cells, enzymes expressed in normal, non-cancerous cells, enzymes overexpressed as a result of prior therapy (e.g., antibiotic or chemotherapy), or enzymes expressed in a specified tissue type (e.g., breast versus liver). The organism is selected from the group consisting of an animal, a vertebrate, an avian, a mammal, a human patient, a pet, a farm animal, a plant, and a plant root. In a further aspect, the target enzyme is present in the pathogen or in the infected cell but normally absent in the host or in uninfected host cells.

Although the method can utilize privately generated databases, it also can be practiced using publicly available databases, as exemplified below. Examples of databases include, but are not limited to commercially available genomic and protein databases (e.g., LifeSeq® available from Incyte Genomics, Inc.). Examples of public domain databases containing information that can be processed according to the invention can be accessed at a number of internet locations or Web sites. One such database is located at a Web site called WIT (a world wide web based system to support the curation of functional assignments made to genes, now "ERGO") maintained by the Argonne National Laboratory of the University of Chicago. Another such database is located at a web site called KEGG (Kyoto Encyclopedia of Genes and Genomes) currently maintained by the Institute for Chemical Research at Kyoto University, Japan. The actual URL (universal resource locator) used to access WIT can change, but has recently been used as <http://wit.mcs.anl.gov/WIT2>. Similarly, the KEGG site <http://www.blast.genome.ad.jp/kegg/kegg2.html> can be used.



In one embodiment, the databases are searched for enzymes using their respective Enzyme Commission Numbers ("EC"). ECs uniquely identify individual enzymes and are interpretable in terms of the reaction mechanism of each enzyme so named. Thus, these numbers can be useful for sorting through large numbers of candidate enzyme entries in a variety of databases.

In another embodiment of the invention, the method requires selecting from a database an enzyme that is expressed by an infectious agent or in an infected cell and comparing these results with a database of expressed enzymes in at least one different class of organisms. In one aspect, these results are further compared to a database comprising enzymes expressed by yet a different class of organisms to identify an enzyme that is expressed in at least one class of organisms but not expressed in another class of organisms. For example, the method is useful to identify target enzymes present in a pathological organism but absent in an uninfected subject host such as enzymes present in pathogenic bacteria but not in human cells.

In a further embodiment of the present invention, a list of the identified enzymes may also be outputted. In another embodiment of the present invention, the identified enzymes may further be organized into a first set of enzymes capable of being placed into metabolic pathways and a second set of enzymes not capable of being placed into metabolic pathways. The first and second sets of enzymes may then be displayed such that the first set of enzymes is distinguishable from the second set of enzymes. In such an embodiment, a third data structure may be queried to organize the identified enzymes.

The methods described herein selected for iECTA targets shown in Figures 7A and 7B. However, new entries are added everyday to the databases. Accordingly, the practice of this invention subsequent to the filing of the present application will identify iECTA enzymes not listed in Figure 7A and 7B. In some embodiments, the newly identified enzymes are presently identified by percentage homology to an enzyme shown in Figures

7A and B. Also termed “biologically equivalent iECTA enzymes” are characterized by possessing at least 75%, or at least 80%, or at least 90% or at least 95% amino acid sequence homology as determined using a sequence alignment program under default parameters correcting for ambiguities in the sequence data, changes in nucleotide sequence that do not alter the amino acid sequence because of degeneracy of the genetic code, conservative amino acid substitutions and corresponding changes in nucleotide sequence, and variations in the lengths of the aligned sequences due to splicing variants or small deletions or insertions between sequences that do not affect function.

In a separate embodiment, a “biological equivalent” intends a protein sequence identified by BLAST search using our the iECTA sequence as input and that results in “hits” having E values indicating that the probability that the “hit” is due to chances is less than 1 in 1000, or 1 in 100, or 1 in 10. This identifies any protein that is related at all, even if the sequence similarity by alignment is less than 10%. Catalytically equivalent enzymes have been identified by BLAST search in this way, even when the % similarity is on the order of a few percent. Human telomerase is a good example of this, because it was identified by BLAST search using a protein sequence obtained from the corresponding enzyme of the ciliate *Euplotes*.

In general, iECTA enzymes having one or more of the following characteristics: 1) enzyme is expressed only by the pathogen of interest or in the cell infected with the pathogen; 2) enzyme is expressed by the pathogen of interest but not by the host organism; 3) enzyme is part of a critical biochemical pathway for the pathogen or cell infected by the pathogen; or 4) enzyme is or is analogous to an enzyme present in a “favorable reaction type” in the pathogen or in a cell infected by the pathogen.

Other examples of pathogen-specific enzymes include drug resistance enzymes expressed by those organisms. Examples include resistance plasmid-encoded drug-modifying enzymes (e.g., chloramphenicol acetyl transferase and other plasmid- or chromosomally-encoded enzymes like beta-lactamases, Table 1, Part C). Intrinsic ECTA targets differ from resistance

ECTA targets only in that the intrinsic enzymes (e.g., viral encoded protease) are present or expressed in naïve or untreated pathogens. Resistance enzymes are typically only expressed or expressed at elevated levels as a result of challenge by therapeutic agents such as enzyme inhibitors.

- 5           As noted above, the method of this invention, identifies enzymes that occur in one class of organisms, but NOT in another class. The "class" can be defined by the user. It is likely that, contained in the output list of enzymes, some enzymes will be more amenable than others to development for iECTA. The described technique allows for an examination of the
- 10 original output list for enzymes with unique mechanisms of action (analogous to the enzymes described in Table 1, below).

Table 1. Examples of Enzyme Targets for ECTA Technology

Enzyme	Example Disease/Pathogen	Example Inhibitors	Mechanisms of Resistance	Referenced (Examples)
Part A. Examples of Endogenous Overexpressed Enzymes in Cancer				
Thymidylate synthase (TS)	Cancer	Fluoropyrimidines, Tomudex, Multitargeted Antifolates (MTA)	Overexpression Mutations Salvage Pathways	Lonn et al. (1996) Kobayashi et al. (1995) Jackman et al. (1995)
Dihydrofolate reductase (DHFR)	Cancer	Methotrexate	Overexpression	Banerjee et al. (1995) Bertino et al. (1996)
Ornithine decarboxylase (ODC)	Cancer	$\alpha$ -Difluoromethylornithine (DFMO)	Overexpression	Das et al. (2000)
Cyclin-dependent Kinases 4 and 6 (cdk 4,6)	Cancer	Flavopiridol	Unknown	Ruas and Peters (1998) Sausville et al. (1999)

Enzyme	Example Disease/ Pathogen	Example Inhibitors	Mechanisms of Resistance	Referenced (Examples)
<b>Table 1. Part B. Virally Encoded Enzymes</b>				
Viral Protease	HIV, HCV	Indinavir, ritonavir	Mutations	Venturi et al. (2000) Blight et al. (1998)
Reverse Transcriptase	HIV, other retrovirus	AZT, other nucleoside or Nonnucleoside analogs	Mutations	Shirasaka et. al. (1995) Venturi et al (2000) Casado et al. (2000)
RNA-dependent RNA-polymerase	HCV and other Flaviviruses	Peptide-based Alpha-diketones	Unknown	Blight et al. (1998) Han et al. (2000)
Neuraminidase (NA)	Influenza	Derivatives of 2-deoxy-2,3-dehydro-N-acetylneuraminic acid (Neu5Ac2en)	Mutations	Staschke et al. (1995) Varghese et al. (1998)
DNA polymerase (DNAse)	Hepatitis B	Lamivudine	Mutations	Malik et al. (2000)

Table 1. Part C. Pathogen-Specific Enzyme				
Acetolactate Synthase (AcLS)	Bacterial and Fungal Infections	Herbicides e.g., sulfonylurea	Overexpression Mutations	Whitcomb. (1999) Harms et al. (1992)
Ketol-Acid Reductoisomerase (KARI)	Bacterial and Fungal Infections	N-Hydroxy-N-isopropyl-oxamate	Not described	Aulabaugh and Schloss (1990)
Beta-lactamase (BL)	Drug-Resistant Bacterial Infections	Clavulanic acid Sulbactam	Overexpression Mutations	Bonomo et al (1999)
Dihydrofolate reductase (DHFR)	Drug-Resistant Bacterial Infections	Trimethoprim	Mutations	Amyes et al, (1992)
Chloramphenicol Acetyl Transferase (CAT)	Drug-Resistant Bacterial Infections	N/A	Overexpression	Kleanthous et al (1985) Shaw et al (1988) Shaw et al (1991)
Peptidoglycan Glycosyltransferase (aka Penicillin Binding Protein (PBP))	Drug-Resistant Bacterial Infections	Methicillin Vancomycin	Mutations	Berger-Bachi et al (1989) Hanaki et al, (1998)
Van A Peptide Ligase	Drug Resistant Bacterial Infections	Vancomycin LY333328	Mutations	Armstrong and Cohen (1999)
Van H Pyruvate D-Lactic Acid Convertase				Lessard et al, (1999)
Van HD dehydrogenase				Arthur et al. (1999)
Van YD DD-carboxypeptidase				Casadewall et al. (1999)

Table 1. Part C. (continued)				
D-alanine racemase	Mycobacteria	D-cycloserine	Overexpression	Caceres et al. (1997)
Mycolate maturation enzymes	Tuberculosis Mycobacteria	Thiolactomycin	Not Known	Yuan et al (1998)
Catalase Peroxide	Tuberculosis Mycobacteria	Isoniazid	Mutation	Meisel et al (1998)
Kat G-encoded catalase	Mycobacteria	Isoniazid	Overexpression and mutation	Mdluli et al. (1998)
InhA, NADH-dependent enoyl acyl carrier protein reductase	Mycobacteria	Isoniazid	Overexpression and mutation	Miesel et al. (1998)
Pyrazine amidase	Mycobacteria	Pyrazinamide	Mutation	Raynaud et al. (1999)
CMA-1, related to <i>E. coli</i> cyclopropane fatty acid synthase	Mycobacteria	Unknown	Unknown	Yuan et al. (1995)

The methods can be practiced using local alignment search algorithms (i.e., BLAST, FASTA) or by directly searching various genome sequence databases, see for example, Figures 3 and 4. This method can be applied to any target organism for which DNA sequence information is available. These databases include microbial genome databases, human genome databases, and expressed sequence tag databases. This invention provides a way of querying databases using genome sequence information to identify potential iECTA enzymes. For example, an open reading frame (ORF) amino acid sequence is obtained for each target using a search program to determine which of these represents an enzyme (EC number) according to current annotation. Using a local alignment algorithm such as BLAST, the amino acid sequence of the candidate enzyme is compared with each sequence of a database consisting of human expressed sequence tags. The result obtained by these comparisons can be interpreted as a probability that

an enzyme represented by sequence data is expressed in human cells. This would indicate that the target organism shared a common ancestor with humans and that the enzyme from humans and the target organism are related. If the enzymes are so related, they may share traits such as similar  
5 mechanism of action and similar substrate specificity and this might counter indicate the usefulness of related enzymes as iECTA targets.

As noted above, the methods of this invention identify enzymes and metabolic pathways present in the pathogenic organisms, but absent in the host, and as such, are a source of selectivity. For example, some pathways,  
10 as well as the enzymes involved, have only been found in bacteria, fungi and plants and not in mammalian cells. One example is the synthesis of "essential" amino acids - amino acids that animals cannot synthesize and must ingest with food (see Table 2 and Nelson and Cox (1972)).

15 **Table 2. Amino Acid Biosynthetic Pathways Not Present in Humans**

Threonine	Leucine
Methionine	Histidine
Valine	Phenylalanine
Isoleucine	Tryptophan
Lysine	

This invention also provides a means of uncovering potential enzyme targets in pathways that are common only in biochemical outcome but differ  
20 in route taken. For example, cysteine is not an essential amino acid, but many pathogenic microbes synthesize cysteine in a fashion different from humans and other higher organisms. The enzyme cysteine synthase (EC 4.2.99.8) is not found in humans, drosophila, or mus muscalus according to our search algorithm and is therefore a potential ECTA target.

25 These promising results suggest the utility of the iECTA approach in treating other diseases characterized by expression of pathogen specific enzymes (Table 1; Parts B and C). For example, HIV-1 protease (Table 1; Part B) is required for specific cleavage of virus-encoded gp160 to yield



gp120, which is necessary for virus maturation (Markowitz and Ho (1996)). Protease inhibitors have been used for patient treatment, and inhibitor-resistant mutants of the enzyme have been described (Shirasaka, et al. (1995) and Venturi, et al. (2000)). A possible iECTA compound is based on the structure of a pharmacophore derived from the natural gp160 cleavage site (Kirkpatrick, et al. (1999); Bohocek and Martin (1997); and Ekins, et al. (1999)), such that reaction with protease leads to the formation of a toxin in virus infected cells. Because HIV protease is present only in virus-infected cells, only those cells will be affected following exposure to an HIV protease iECTA compound. Other examples of possible virally encoded iECTA targets include essential viral-specific replication enzymes like reverse transcriptase encoded by retroviruses (e.g., HIV), and RNA-dependent RNA polymerase encoded by flaviviruses (e.g., HCV). For iECTA applications it is critical that the target enzyme is required for viability or pathogenesis of the infectious agent. For this reason, dispensable viral enzymes are not preferred targets. An important example of a dispensable viral enzyme is the herpes virus-encoded thymidine kinase (Coen (1996) and Oram, et al. (2000)). For this reason, the herpes virus-encoded thymidine kinase is not included as a preferred target in Table 2, while essential enzymes like reverse transcriptase, RNA-dependent RNA polymerase and virally-encoded proteases are included. Pathogen specific enzymes are listed in Table 1 (Part C).

### **Hardware Implementation of the Methods and Systems**

The methods of this invention operate on a typical computer system. The computer system can include various input devices such as a keyboard. The computer system also includes a processor such as CPU and internal memory. The processor may be a special purpose processor with database processing capabilities or it may be a general-purpose processor. The memory may comprise various types of memory, including RAM, ROM, and the like. The computer system also includes external storage that includes

devices such as disks, CD ROMs, ASICs, external RAM, external ROM and the like.

The present invention can be implemented as part of the processor or as a program residing in memory and external storage and running on processor or as a combination of program and specialized hardware. When  
5 in memory and/or external storage the program can be in a RAM, a ROM, an internal or external disk, a CD ROM, an ASIC or the like. In general, when implemented as a program or in part as a program, the program can be encoded on any computer-readable medium or combination of computer-  
10 readable media, including but not limited to a RAM, a ROM, a disk, an ASIC, a PROM and the like. The computer system also includes a display and, optionally, an output device such as a printer.

The computer system can run any operating system and can be implemented in any computer programming language or combination of  
15 computer programming languages, although preferably it is implemented, at least in part, in a language which is suitable for database access and manipulation.

Thus, in another aspect, this invention provides a system for identifying enzymes for designing Enzyme Catalyzed Therapeutic Activation  
20 (ECTA) compounds, comprising logic for searching a first data structure to obtain a first set of information relating to one or more enzymes associated with a target organism that are expressed in a pathological cell or by a infectious agent or in an infected cell as compared to a suitable control and logic for searching one or more other data structures to obtain one or more  
25 additional sets of information relating to one or more expressed enzymes associated with one or more additional classes of organisms that are expressed respective class. The system also comprises logic for comparing the first set of information to the one or more additional sets of information to identify enzymes in the first set of information that are not present in the  
30 one or more additional sets of information, wherein the identified enzymes are capable of being used to design ECTA compounds. In one embodiment,

the enzymes are overexpressed as compared to a suitable control. In yet a further aspect, the overexpressed enzyme is the result of prior treatment, e.g., antibiotic or chemotherapy. In another aspect, the system further comprises logic for outputting a list of the identified enzymes. In yet a further aspect, 5 the system comprises logic for organizing the identified enzymes into a first set of enzymes capable of being placed into metabolic pathways and a second set of enzymes not capable of being placed into metabolic pathways; and logic for displaying the first and second sets of enzymes such that the first set of enzymes are distinguishable from the second set of enzymes. In a further 10 embodiment, a third data structure is queried to organize the identified enzymes.

The system can be part of a network that is utilized to search at least one of the first data structure and the second data structure. Examples of suitable networks include, but are not limited to, a network capable of 15 communicating utilizing TCP/IP or IPX protocols.

In a further aspect, the information relating to the one or more enzymes of the organism includes information about Enzyme Commission (EC) numbers of the one or more enzymes. In yet a further aspect, the one or more additional sets of information relating to the one or more expressed 20 enzymes associated with one or more classes of organisms includes information about Enzyme Commission (EC) numbers of the one or more expressed enzymes.

This invention further provides a computer program product for identifying enzymes for designing Enzyme Catalyzed Therapeutic Activation 25 (ECTA) compounds, comprising computer code for searching a first data structure to obtain a first set of information relating to one or more enzymes associated with a pathological cell, by an infectious agent or in an infected cell and computer code for searching one or more other data structures to obtain one or more additional sets of information relating to one or more 30 expressed enzymes associated with one or more additional classes of organisms that are express. The program product also contains computer

code for comparing the first set of information to the one or more additional sets of information to identify enzymes in the first set of information that are not present in the one or more additional sets of information, wherein the identified enzymes are capable of being used to design ECTA compounds.

5 Further additions include, but are not limited to computer code for outputting a list of the identified enzymes, computer code for organizing the identified enzymes into a first set of enzymes capable of being placed into metabolic pathways and a second set of enzymes not capable of being placed into metabolic pathways; and computer code for displaying the first and second  
10 sets of enzymes such that the first set of enzymes are distinguishable from the second set of enzymes. When a third data structure is queried or searched, a third code is supplied to query and optionally organize the information. Optionally, the information regarding enzyme expression can be organized according to ECC number. The system can work on a stand  
15 alone computer system or be a component of a network. In one aspect, the network is capable of communicating utilizing TCP/IP or IPX protocols.

Figure 2C is a flowchart for process 240 for identifying iECTA enzymes for designing iECTA compounds in accordance with an embodiment of the present invention. In operation 242, a first data structure  
20 is searched to obtain a first set of information relating to one or more enzymes associated with a target organism that are expressed at an elevated level in a pathological cell as compared to a normal counterpart cell or host cell. In operation 244, one or more other data structures are searched to obtain one or more additional sets of information relating to one or more  
25 expressed enzymes associated with one or more additional classes of organisms that are expressed at elevated levels in the respective class. The first set of information is compared to the one or more additional sets of information in operation 246 to identify enzymes in the first set of information that are not present in the one or more additional sets of  
30 information.

In one aspect of the present invention, a network may be utilized to search the first data structure and/or the second data structure. In such an aspect, the network may be capable of communicating utilizing TCP/IP and/or IPX protocols. In another aspect, the information relating to the one or more enzymes of the target organism may include information about Enzyme Commission (EC) numbers of the one or more enzymes. Similarly, the one or more additional sets of information relating to the one or more expressed enzymes associated with one or more classes of organisms may also include information about Enzyme Commission (EC) numbers of the one or more expressed enzymes. In a further aspect, the identified enzymes may be capable of being used to design iECTA compounds.

As an option, operations 244 and 246 may be executed sequentially for each additional database. In other words, operations 244 and 246 may be repeated for each additional database searched. For example, operations 244 and 246 may be executed for a first additional database (i.e., a second database) to obtain a first output which identifies enzymes in the first set of information that are not present in the information obtained from the first additional database. Operations 244 and 246 may then be executed utilizing the first output and a second additional database (i.e., a third database) to obtain a second output which identifies enzymes in the first set of information that are not present in the information obtained from the second additional database, and so on.

Figure 2D is a schematic diagram of an illustrative system 250 capable of executing the process 240 for identifying enzymes for designing ECTA compounds set forth in Figure 2C in accordance with an embodiment of the present invention. In particular, a user's computer 252 is connected via a network 254 (e.g., a LAN or a WAN such as the Internet) to a plurality of databases 256, 258, 260 (i.e., data structures). As illustrated in Figure 2D, each database 256, 258, 260 may be hosted by a separate server 262, 264, 266 connected to the network. However, it should be understood that the

databases may be hosted all on one server or on two servers, or even more than three servers.

One of the databases of the system 250 may contain information relating to one or more enzymes associated with a target organism that are expressed at an elevated level in a pathological cell as compared to a normal counterpart or host cell. A second of the databases may contain information relating to one or more expressed enzymes associated with another class of organisms that are express at elevated levels in the particular class. The user's computer 242 may be utilized to compare the information obtained from the databases.

Figure 8 illustrates an exemplary system 1200 with a plurality of components 1202 in accordance with an embodiment of the present invention. As shown, such components include a network 1204 which take any form including, but not limited to a local area network, a wide area network such as the Internet, etc. Coupled to the network 1204 is a plurality of computers which may take the form of desktop computers 1206, laptop computers 1208, hand-held computers 1210, or any other type of computing hardware/software. As an option, the various computers may be connected to the network 1204 by way of a server 1212 which may be equipped with a firewall for security purposes. It should be noted that any other type of hardware or software may be included in the system and be considered a component thereof.

A representative hardware environment associated with the various components of Figure 8 is depicted in Figure 9. In the present description, the various sub-components of each of the components may also be considered components of the system. For example, particular software modules executed on any component of the system may also be considered components of the system. Figure 9 illustrates a typical hardware configuration of a workstation in accordance with one embodiment having a central processing unit 1310, such as a microprocessor, and a number of other units interconnected via a system bus 1312.

The workstation shown in the figure includes a Random Access Memory (RAM) 1314, Read Only Memory (ROM) 1316, an I/O adapter 1318 for connecting peripheral devices such as disk storage units 1320 to the bus 1312, a user interface adapter 1322 for connecting a keyboard 1324, a mouse 1326, a speaker 1328, a microphone 1332, and/or other user interface devices such as a touch screen (not shown) to the bus 1312, communication adapter 1334 for connecting the workstation to a communication network 1335 (e.g., a data processing network) and a display adapter 1336 for connecting the bus 1312 to a display device 1338.

10

### **Software Implementation of the Methods and Systems**

The workstation typically has resident thereon an operating system such as, for example: the Microsoft Windows NT or Windows 95/98/2000 Operating System (OS), the IBM OS/2 operating system, the MAC OS, or UNIX operating system. Those skilled in the art will appreciate that the present invention may also be implemented on platforms and operating systems other than those mentioned.

15

An embodiment may be written using JAVA, C, and the C++ language and utilizes object oriented programming methodology or any other means. Object oriented programming (OOP) has become increasingly used to develop complex applications. As OOP moves toward the mainstream of software design and development, various software solutions require adaptation to make use of the benefits of OOP. A need exists for these principles of OOP to be applied to a messaging interface of an electronic messaging system such that a set of OOP classes and objects for the messaging interface can be provided. OOP is a process of developing computer software using objects, including the steps of analyzing the problem, designing the system, and constructing the program. An object is a software package that contains both data and a collection of related structures and procedures. Since it contains both data and a collection of structures and procedures, it can be visualized as a self-sufficient component that does not

25

30

require other additional structures, procedures or data to perform its specific task. OOP, therefore, views a computer program as a collection of largely autonomous components, called objects, each of which is responsible for a specific task. This concept of packaging data, structures, and procedures  
5 together in one component or module is called encapsulation.

In general, OOP components are reusable software modules which present an interface that conforms to an object model and which are accessed at run-time through a component integration architecture. A component integration architecture is a set of architecture mechanisms which allow  
10 software modules in different process spaces to utilize each others capabilities or functions. This is generally done by assuming a common component object model on which to build the architecture. It is worthwhile to differentiate between an object and a class of objects at this point. An object is a single instance of the class of objects, which is often just called a  
15 class. A class of objects can be viewed as a blueprint, from which many objects can be formed.

OOP allows the programmer to create an object that is a part of another object. For example, the object representing a piston engine is to have a composition-relationship with the object representing a piston. In  
20 reality, a piston engine comprises a piston, valves and many other components; the fact that a piston is an element of a piston engine can be logically and semantically represented in OOP by two objects.

OOP also allows creation of an object that "depends from" another object. If there are two objects, one representing a piston engine and the  
25 other representing a piston engine wherein the piston is made of ceramic, then the relationship between the two objects is not that of composition. A ceramic piston engine does not make up a piston engine. Rather it is merely one kind of piston engine that has one more limitation than the piston engine; its piston is made of ceramic. In this case, the object representing the  
30 ceramic piston engine is called a derived object, and it inherits all of the aspects of the object representing the piston engine and adds further



limitation or detail to it. The object representing the ceramic piston engine “depends from” the object representing the piston engine. The relationship between these objects is called inheritance.

When the object or class representing the ceramic piston engine inherits all of the aspects of the objects representing the piston engine, it inherits the thermal characteristics of a standard piston defined in the piston engine class. However, the ceramic piston engine object overrides these ceramic specific thermal characteristics, which are typically different from those associated with a metal piston. It skips over the original and uses new functions related to ceramic pistons. Different kinds of piston engines have different characteristics, but may have the same underlying functions associated with it (e.g., how many pistons in the engine, ignition sequences, lubrication, etc.). To access each of these functions in any piston engine object, a programmer would call the same functions with the same names, but each type of piston engine may have different/overriding implementations of functions behind the same name. This ability to hide different implementations of a function behind the same name is called polymorphism and it greatly simplifies communication among objects.

With the concepts of composition-relationship, encapsulation, inheritance and polymorphism, an object can represent just about anything in the real world. In fact, one’s logical perception of the reality is the only limit on determining the kinds of things that can become objects in object-oriented software. Some typical categories are as follows:

- Objects can represent physical objects, such as automobiles in a traffic-flow simulation, electrical components in a circuit-design program, countries in an economics model, or aircraft in an air-traffic-control system.
- Objects can represent elements of the computer-user environment such as windows, menus or graphics objects.
- An object can represent an inventory, such as a personnel file or a table of the latitudes and longitudes of cities.

- An object can represent user-defined data types such as time, angles, and complex numbers, or points on the plane.

With this enormous capability of an object to represent just about any logically separable matters, OOP allows the software developer to design and  
5 implement a computer program that is a model of some aspects of reality, whether that reality is a physical entity, a process, a system, or a composition of matter. Since the object can represent anything, the software developer can create an object which can be used as a component in a larger software project in the future.

10 If 90% of a new OOP software program consists of proven, existing components made from preexisting reusable objects, then only the remaining 10% of the new software project has to be written and tested from scratch. Since 90% already came from an inventory of extensively tested reusable objects, the potential domain from which an error could originate is 10% of  
15 the program. As a result, OOP enables software developers to build objects out of other, previously built objects.

This process closely resembles complex machinery being built out of assemblies and sub-assemblies. OOP technology, therefore, makes software engineering more like hardware engineering in that software is built from  
20 existing components, which are available to the developer as objects. All this adds up to an improved quality of the software as well as an increased speed of its development.

Programming languages are beginning to fully support the OOP principles, such as encapsulation, inheritance, polymorphism, and  
25 composition-relationship. With the advent of the C++ language, many commercial software developers have embraced OOP. C++ is an OOP language that offers a fast, machine-executable code. Furthermore, C++ is suitable for both commercial-application and systems-programming projects. For now, C++ appears to be the most popular choice among many OOP  
30 programmers, but there is a host of other OOP languages, such as Smalltalk, Common Lisp Object System (CLOS), and Eiffel. Additionally, OOP

capabilities are being added to more traditional popular computer programming languages such as Pascal.

The benefits of object classes can be summarized, as follows:

- 5       • Objects and their corresponding classes break down complex programming problems into many smaller, simpler problems.
- Encapsulation enforces data abstraction through the organization of data into small, independent objects that can communicate with each other. Encapsulation protects the data in an object from accidental damage, but allows other objects to interact with that data by calling the object's member functions and structures.
- 10       • Subclassing and inheritance make it possible to extend and modify objects through deriving new kinds of objects from the standard classes available in the system. Thus, new capabilities are created without having to start from scratch.
- 15       • Polymorphism and multiple inheritance make it possible for different programmers to mix and match characteristics of many different classes and create specialized objects that can still work with related objects in predictable ways.
- Class hierarchies and containment hierarchies provide a flexible mechanism for modeling real-world objects and the relationships among them.
- 20       • Libraries of reusable classes are useful in many situations, but they also have some limitations. For example:
- Complexity. In a complex system, the class hierarchies for related classes can become extremely confusing, with many dozens or even hundreds of classes.
- 25       • Flow of control. A program written with the aid of class libraries is still responsible for the flow of control (i.e., it must control the interactions among all the objects created from a particular library).
- 30       The programmer has to decide which functions to call at what times for which kinds of objects.

- Duplication of effort. Although class libraries allow programmers to use and reuse many small pieces of code, each programmer puts those pieces together in a different way. Two different programmers can use the same set of class libraries to write two programs that do exactly the same thing but whose internal structure (i.e., design) may be quite different, depending on hundreds of small decisions each programmer makes along the way. Inevitably, similar pieces of code end up doing similar things in slightly different ways and do not work as well together as they should.

Class libraries are very flexible. As programs grow more complex, more programmers are forced to reinvent basic solutions to basic problems over and over again. A relatively new extension of the class library concept is to have a framework of class libraries. This framework is more complex and consists of significant collections of collaborating classes that capture both the small scale patterns and major mechanisms that implement the common requirements and design in a specific application domain. They were first developed to free application programmers from the chores involved in displaying menus, windows, dialog boxes, and other standard user interface elements for personal computers.

Frameworks also represent a change in the way programmers think about the interaction between the code they write and code written by others. In the early days of procedural programming, the programmer called libraries provided by the operating system to perform certain tasks, but basically the program executed down the page from start to finish, and the programmer was solely responsible for the flow of control. This was appropriate for printing out paychecks, calculating a mathematical table, or solving other problems with a program that executed in just one way.

The development of graphical user interfaces began to turn this procedural programming arrangement inside out. These interfaces allow the user, rather than program logic, to drive the program and decide when certain actions should be performed. Today, most personal computer software

accomplishes this by means of an event loop which monitors the mouse, keyboard, and other sources of external events and calls the appropriate parts of the programmer's code according to actions that the user performs. The programmer no longer determines the order in which events occur. Instead, a  
5 program is divided into separate pieces that are called at unpredictable times and in an unpredictable order. By relinquishing control in this way to users, the developer creates a program that is much easier to use. Nevertheless, individual pieces of the program written by the developer still call libraries provided by the operating system to accomplish certain tasks, and the  
10 programmer must still determine the flow of control within each piece after it's called by the event loop. Application code still "sits on top of" the system.

Even event loop programs require programmers to write a lot of code that should not need to be written separately for every application. The  
15 concept of an application framework carries the event loop concept further. Instead of dealing with all the nuts and bolts of constructing basic menus, windows, and dialog boxes and then making these things all work together, programmers using application frameworks start with working application code and basic user interface elements in place. Subsequently, they build  
20 from there by replacing some of the generic capabilities of the framework with the specific capabilities of the intended application.

Application frameworks reduce the total amount of code that a programmer has to write from scratch. However, because the framework is really a generic application that displays windows, supports copy and paste,  
25 and so on, the programmer can also relinquish control to a greater degree than event loop programs permit. The framework code takes care of almost all event handling and flow of control, and the programmer's code is called only when the framework needs it (e.g., to create or manipulate a proprietary data structure).

30 A programmer writing a framework program not only relinquishes control to the user (as is also true for event loop programs), but also

relinquishes the detailed flow of control within the program to the framework. This approach allows the creation of more complex systems that work together in interesting ways, as opposed to isolated programs, having custom code, being created over and over again for similar problems.

5           Thus, as is explained above, a framework basically is a collection of cooperating classes that make up a reusable design solution for a given problem domain. It typically includes objects that provide default behavior (e.g., for menus and windows), and programmers use it by inheriting some of that default behavior and overriding other behavior so that the framework  
10       calls application code at the appropriate times.

          There are three main differences between frameworks and class libraries:

- Behavior versus protocol. Class libraries are essentially collections of behaviors that you can call when you want those individual behaviors  
15       in your program. A framework, on the other hand, provides not only behavior but also the protocol or set of rules that govern the ways in which behaviors can be combined, including rules for what a programmer is supposed to provide versus what the framework provides.
- 20   •       Call versus override. With a class library, the programmer instantiates objects and calls their member functions. It is possible to instantiate and call objects in the same way with a framework (i.e., to treat the framework as a class library), but to take full advantage of a  
25       framework's reusable design, a programmer typically writes code that overrides and is called by the framework. The framework manages the flow of control among its objects. Writing a program involves dividing responsibilities among the various pieces of software that are called by the framework rather than specifying how the different pieces should work together.
- 30   •       Implementation versus design. With class libraries, programmers reuse only implementations, whereas with frameworks, they reuse

design. A framework embodies the way a family of related programs or pieces of software work. It represents a generic design solution that can be adapted to a variety of specific problems in a given domain.

For example, a single framework can embody the way a user interface works, even though two different user interfaces created with the same framework might solve quite different interface problems.

Thus, through the development of frameworks for solutions to various problems and programming tasks, significant reductions in the design and development effort for software can be achieved. A preferred embodiment of the invention utilizes HyperText Markup Language (HTML) to implement documents on the Internet together with a general-purpose secure communication protocol for a transport medium between the client and the Newco. HTTP or other protocols could be readily substituted for HTML without undue experimentation. Information on these products is available in T. Berners-Lee, D. Connolly, "RFC 1866: Hypertext Markup Language - 2.0" (Nov. 1995); and R. Fielding, H. Frystyk, T. Berners-Lee, J. Gettys and J.C. Mogul, "Hypertext Transfer Protocol -- HTTP/1.1: HTTP Working Group Internet Draft" (May 2, 1996). HTML is a simple data format used to create hypertext documents that are portable from one platform to another. HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of domains. HTML has been in use by the World-Wide Web global information initiative since 1990. HTML is an application of ISO Standard 8879; 1986 Information Processing Text and Office Systems; Standard Generalized Markup Language (SGML).

To date, Web development tools have been limited in their ability to create dynamic Web applications which span from client to server and interoperate with existing computing resources. Until recently, HTML has been the dominant technology used in development of Web-based solutions. However, HTML has proven to be inadequate in the following areas:

- Poor performance;
- Restricted user interface capabilities;

- Can only produce static Web pages;
- Lack of interoperability with existing applications and data; and
- Inability to scale.

Sun Microsystems's Java language solves many of the client-side  
5 problems by:

- Improving performance on the client side;
- Enabling the creation of dynamic, real-time Web applications; and
- Providing the ability to create a wide variety of user interface components.

10 With Java, developers can create robust User Interface (UI) components. Custom "widgets" (e.g., real-time stock tickers, animated icons, etc.) can be created, and client-side performance is improved. Unlike HTML, Java supports the notion of client-side validation, offloading appropriate processing onto the client for improved performance. Dynamic,  
15 real-time Web pages can be created. Using the above-mentioned custom UI components, dynamic Web pages can also be created.

Sun's Java language has emerged as an industry-recognized language for "programming the Internet." Sun defines Java as: "a simple, object-oriented, distributed, interpreted, robust, secure, architecture-neutral,  
20 portable, high-performance, multithreaded, dynamic, buzzword-compliant, general-purpose programming language. Java supports programming for the Internet in the form of platform-independent Java applets." Java applets are small, specialized applications that comply with Sun's Java Application Programming Interface (API) allowing developers to add "interactive  
25 content" to Web documents (e.g., simple animations, page adornments, basic games, etc.). Applets execute within a Java-compatible browser (e.g., Netscape Navigator) by copying code from the server to client. From a language standpoint, Java's core feature set is based on C++. Sun's Java literature states that Java is basically, "C++ with extensions from Objective C  
30 for more dynamic method resolution."



Another technology that provides similar function to JAVA is provided by Microsoft and ActiveX Technologies, to give developers and Web designers wherewithal to build dynamic content for the Internet and personal computers. ActiveX includes tools for developing animation, 3-D  
5 virtual reality, video and other multimedia content. The tools use Internet standards, work on multiple platforms, and are being supported by over 100 companies. The group's building blocks are called ActiveX Controls, small, fast components that enable developers to embed parts of software in hypertext markup language (HTML) pages. ActiveX Controls work with a  
10 variety of programming languages including Microsoft Visual C++, Borland Delphi, Microsoft Visual Basic programming system and, in the future, Microsoft's development tool for Java, code named "Jakarta." ActiveX Technologies also includes ActiveX Server Framework, allowing developers to create server applications. One of ordinary skill in the art readily  
15 recognizes that ActiveX could be substituted for JAVA without undue experimentation to practice the invention.

#### **iECTA Targets for Bacterial and Fungal Infections**

In this embodiment of this invention, the method requires comparing the  
20 results of a database search of enzymes expressed in an infected cell or by an infectious agent with a database search for enzymes expressed by a different class of organisms to identify an enzyme that is expressed in at least one class of organisms but not expressed in another class of organisms. In an alternative embodiment, additional organism can be searched. In a further embodiment,  
25 the enzyme is overexpressed in the first class of organism as compared to the second class of organism or vice versa.

By searching the WIT database (now ERGO) EC 3.5.2.7 was found to occur in the genomes of a number of pathogenic organisms, including  
*Enterococcus faecalis*, *Helicobacter pylori*, *Pseudomonas aeruginosa*, and  
30 *Yersinia pestis*. The amino acid sequence of the enzyme was also obtained from this database, and by using the tBLASTn algorithm to search a database

with human gene sequences, it was found that the smallest sum probability 0.048 indicates that there is no human gene in the gene index that has a significant degree of similarity to the bacterial EC 3.5.2.7. This enzyme thus has no homolog in the human gene index, and is therefore a target ECTA enzyme.

Indeed, the practice of this method identified several hundred iECTA target enzymes from 51 pathogenic organisms (See Figure 7A and 7B, which list all the enzymes associated with all the currently annotated pathogens). Natural and ECTA substrates were identified for related groups or sub-classes of enzymes with specific examples detailed in order to exemplify, but not limit, the invention.

Beta-lactamase is an enzyme expressed by bacteria and its expression renders them resistant to beta-lactam antibiotics (Schaechter et al., 1993). Applicant previously identified this enzyme as an ECTA enzyme based on its overexpression as result of prior antibiotic therapy, see PCT Application No. PCT/US98/27493. Thus, in one aspect, beta-lactamase and peptide deformylase are specifically excluded as an iECTA enzyme.

However, the method of the present invention also identified beta-lactamase as an iECTA target enzyme. Other examples of pathogen-specific, drug resistance enzymes include resistance plasmid-encoded drug-modifying enzymes (e.g. chloramphenicol acetyl transferase and other plasmid- or chromosomally-encoded enzymes (Table 1, Part C).

Table 1, Parts B and C provides examples of enzyme targets for ECTA technology which suggest the utility of the ECTA approach in treating other diseases characterized by expression of pathogen specific enzymes.

Additional pathogen specific enzymes are listed in Table 1 (Part C), e.g., the two first enzymes of the branched chain amino acids (BCAA) pathway (acetolactate synthase and ketol-acid reductoisomerase). These enzymes are only functional in bacteria, fungi, and plants, not in humans or most animals (Whitcomb 1999, Chipman et al., 1998). ECTA compounds

targeting these enzymes will selectively attack infectious agents including bacteria and yeast with low toxicity to the host.

### **Selection of Favorable Reaction Type Using Enzyme Commission**

#### **5 Number**

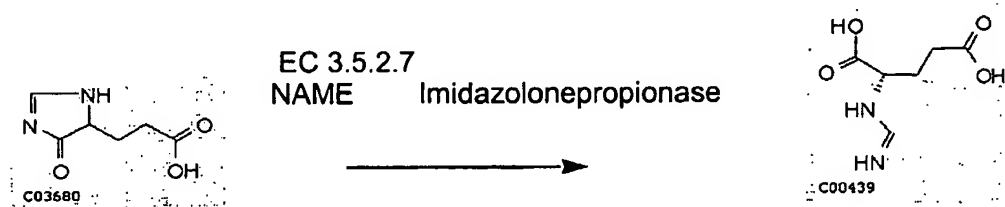
In one aspect, the invention provides a method of selecting iECTA targets by identifying pathogen encoded enzymes that catalyze favorable reaction types. This was accomplished by first selecting a specific enzyme that has been shown to be effective at metabolizing an ECTA substrate and  
10 then using Enzyme Commission numbers to identify enzymes that catalyze a similar reaction in another microorganism. Comparison of the sequences of these pathogen encoded enzymes with a human gene index or by comparison of EC numbers with EC numbers (enzymes) found in humans or other higher organisms was then performed to select individual target enzymes that are  
15 not present in human cells.

The International Enzyme Commission has developed a classification scheme that assigns each enzyme a unique number that specifies which of approximately 4500 distinct reaction types is catalyzed by the enzyme. This method is based on dividing enzyme catalyzed reactions into six classes, then  
20 further subdividing each of these classes, and so on through four levels of classification.

It is desirable in identifying ECTA enzymes to search for specific reaction types or similar reaction types in annotated databases of microbial genomes, for example. The Enzyme Commission numbering system  
25 provides a way of automating these searches. For example, beta-lactamase (EC 3.5.2.6) catalyzes a reaction that has proven to be amenable to development of ECTA substrates. Using this as an example, similar enzymes can be identified in target organisms by selecting EC numbers with varying degrees of similarity to find enzymes catalyzing similar reactions, i.e., the  
30 hydrolysis of cyclic amides.

Since the EC classification system organizes reaction types using four levels, from most general to most similar, enzymes that catalyze similar reactions can be identified by varying the EC number for the last EC class number (i.e., the fourth number listed). An example is shown below where a

5 chemically similar but unique ECTA molecule can be created for an enzyme related to the known ECTA target beta-lactamase (EC 3.5.2.6)



### Design of iECTA Prodrugs

10        Figures 7A and 7B list iECTA target enzymes. The enzymes are organized according to EC number. Enzymes that share the first 3 numbers carry out chemical reactions in a very similar fashion, they just use different substrates. Substrate prodrugs have been designed based on the “natural” generic substrate.

15        The prodrugs were designed by evaluating the enzyme mechanism to determine chemically the best position to substitute the natural substrate with an ECTA prototoxophore. The prototoxophore is chosen based upon the enzyme active site and how the natural substrate binds this site. The prototoxophore can be a simple leaving group appended onto the natural

20        substrate, but it does not necessarily resemble or mimic any or part of the natural substrate. The prototoxophore can be a reactive analogue of a natural fragmentation product that is released (unmasked) only after enzyme activation (for example see EC 4.1.3.27 anthranilate synthase). The

25        prototoxophore can be a small chemical change to the natural substrate that takes advantage of the natural movement of electrons to create a highly reactive and toxic product that resembles the natural product. As used below,

“unspecified” is intended to encompass all possible substituents, limited only by the laws of chemistry and physics and by what is tolerated by the ECTA enzyme target. The Enzyme Commission (EC) numbers define a specific enzyme reaction and therefore dictate the basic scaffold or substrate molecule to which substituents are added to create ECTA substrates or prodrugs. Although the toxin or toxoid is a specified substituent, Applicant intends that the toxin or toxoid be substituted at any appropriate atom on the compound, provided that the function of the compound is retained for its intended purpose.

10

#### EC 1 Oxidoreductases

All enzymes catalysing oxido-reductions belong to this class. The substrate oxidized is regarded as hydrogen or electron donor. The classification is based on 'donor:acceptor oxidoreductase'. The recommended name is 'dehydrogenase', wherever this is possible; as an alternative, 'acceptor reductase' can be used. 'Oxidase' is used only where O<sub>2</sub> is an acceptor. Classification is difficult in some cases, because of the lack of specificity towards the acceptor. A lack of specificity for the acceptor can be a major advantage when making unnatural (ECTA) substrates.

20

##### EC 1.1 Acting on the CH-OH group of donors

EC 1.1.1 With NAD or NADP as acceptor

EC 1.1.2 With a cytochrome as acceptor

EC 1.1.3 With oxygen as acceptor

25

EC 1.1.4 With a disulfide as acceptor

EC 1.1.5 With a quinone or similar compound as acceptor

EC 1.1.99 With other acceptors

##### EC 1.2 Acting on the aldehyde or oxo group of donors

EC 1.2.1 With NAD or NADP as acceptor

30

EC 1.2.2 With a cytochrome as acceptor

EC 1.2.3 With oxygen as acceptor

- EC 1.2.4 With a disulfide as acceptor
- EC 1.2.7 With an iron-sulfur protein as acceptor
- EC 1.2.99 With other acceptors
- EC 1.3 Acting on the CH-CH group of donors
  - 5 EC 1.3.1 With NAD or NADP as acceptor
  - EC 1.3.2 With a cytochrome as acceptor
  - EC 1.3.3 With oxygen as acceptor
  - EC 1.3.5 With a quinone or related compound as acceptor
  - EC 1.3.7 With an iron-sulfur protein as acceptor
  - 10 EC 1.3.99 With other acceptors
- EC 1.4 Acting on the CH-NH<sub>2</sub> group of donors
  - EC 1.4.1 With NAD or NADP as acceptor
  - EC 1.4.2 With a cytochrome as acceptor
  - EC 1.4.3 With oxygen as acceptor
  - 15 EC 1.4.4 With a disulfide as acceptor
  - EC 1.4.7 With an iron-sulfur protein as acceptor
  - EC 1.4.99 With other acceptors
- EC 1.5 Acting on the CH-NH group of donors
  - EC 1.5.1 With NAD or NADP as acceptor
  - 20 EC 1.5.3 With oxygen as acceptor
  - EC 1.5.4 With a disulfide as acceptor
  - EC 1.5.5 With a quinone or similar compound as acceptor
  - EC 1.5.99 With other acceptors
- EC 1.6 Acting on NADH or NADPH
  - 25 EC 1.6.1 With NAD or NADP as acceptor
  - EC 1.6.2 With a heme protein as acceptor
  - EC 1.6.4 With a disulfide as acceptor
  - EC 1.6.5 With a quinone or similar compound as acceptor
  - EC 1.6.6 With a nitrogenous group as acceptor
  - 30 EC 1.6.8 With a flavin as acceptor
  - EC 1.6.99 With other acceptors

- EC 1.7 Acting on other nitrogenous compounds as donors
- EC 1.7.2 With a cytochrome as acceptor
  - EC 1.7.3 With oxygen as acceptor
  - EC 1.7.7 With an iron-sulfur protein as acceptor
  - 5 EC 1.7.99 With other acceptors
- EC 1.8 Acting on a sulfur group of donors
- EC 1.8.1 With NAD or NADP as acceptor
  - EC 1.8.2 With a cytochrome as acceptor
  - EC 1.8.3 With oxygen as acceptor
  - 10 EC 1.8.4 With a disulfide as acceptor
  - EC 1.8.5 With a quinone as acceptor
  - EC 1.8.6 With nitrogenous group as acceptor
  - EC 1.8.7 With an iron-sulfur protein as acceptor
  - EC 1.8.99 With other acceptors
- 15 EC 1.9 Acting on a heme group of donors
- EC 1.9.3 With oxygen as acceptor
    - EC 1.9.3.1 cytochrome-c oxidase
    - EC 1.9.3.2 Pseudomonas cytochrome oxidase
- EC 1.10 Acting on diphenols and related substances as donors
- 20 EC 1.10.1 With NAD or NADP as acceptor
  - EC 1.10.2 With a cytochrome as acceptor
  - EC 1.10.3 With oxygen as acceptor
  - EC 1.10.99 With other acceptors
- EC 1.11 Acting on a peroxide as acceptor
- 25 EC 1.11.1 Peroxidases
    - EC 1.11.1.1 NADH<sub>2</sub> peroxidase
    - EC 1.11.1.2 NADPH<sub>2</sub> peroxidase
    - EC 1.11.1.3 fatty-acid peroxidase
    - EC 1.11.1.4 now EC 1.13.11.11
    - 30 EC 1.11.1.5 cytochrome-c peroxidase
    - EC 1.11.1.6 catalase

- EC 1.11.1.7 peroxidase
- EC 1.11.1.8 iodide peroxidase
- EC 1.11.1.9 glutathione peroxidase
- EC 1.11.1.10 chloride peroxidase
- 5 EC 1.11.1.11 L-ascorbate peroxidase
- EC 1.11.1.12 phospholipid-hydroperoxide glutathione peroxidase
- EC 1.11.1.13 manganese peroxidase
- EC 1.11.1.14 diarylpropane peroxidase
- 10 EC 1.12 Acting on hydrogen as donor
  - EC 1.12.1 With NAD or NADP as acceptor
  - EC 1.12.2 With a cytochrome as acceptor
  - EC 1.12.7 With a iron-sulfur protein as acceptor
  - EC 1.12.99 With other acceptors
- 15 EC 1.13 Acting on single donors with incorporation of molecular oxygen (oxygenases)
  - EC 1.13.11 With incorporation of two atoms of oxygen
  - EC 1.13.12 With incorporation of one atom of oxygen (internal monooxygenases or internal mixed function oxidases)
  - 20 EC 1.13.99 Miscellaneous
- EC 1.14 Acting on paired donors, with incorporation or reduction of molecular oxygen
  - EC 1.14.11 With 2-oxoglutarate as one donor, and incorporation of one atom each of oxygen into both donors
  - 25 EC 1.14.12 With NADH<sub>2</sub> or NADPH<sub>2</sub> as one donor, and incorporation of two atoms of oxygen into one donor
  - EC 1.14.13 With NAD or NADH as one donor, and incorporation of one atom of oxygen
  - EC 1.14.14 With reduced flavin or flavoprotein as one donor, and incorporation of one atom of oxygen
  - 30



- EC 1.14.15 With reduced iron-sulfur protein as one donor, and  
incorporation of one atom of oxygen
- EC 1.14.16 With reduced pteridine as one donor, and  
incorporation of one atom of oxygen
- 5 EC 1.14.17 With reduced ascorbate as one donor, and  
incorporation of one atom of oxygen
- EC 1.14.18 With another compound as one donor, and  
incorporation of one atom of oxygen
- EC 1.14.99 Miscellaneous
- 10 EC 1.15 Acting on superoxide radicals as acceptor
- EC 1.15.1
- EC 1.15.1.1 Recommended name: superoxide  
dismutase
- EC 1.16 Oxidising metal ions
- 15 EC 1.16.1 With NAD or NADP as acceptor
- EC 1.16.3 With oxygen as acceptor
- EC 1.17 Acting on CH<sub>2</sub> groups
- EC 1.17.1 With NAD or NADP as acceptor
- EC 1.17.3 With oxygen as acceptor
- 20 EC 1.17.4 With disulfide as acceptor
- EC 1.17.99 With other acceptors
- EC 1.18 Acting on reduced ferredoxin as donor
- EC 1.18.1 With NAD or NADP as acceptor
- EC 1.18.6 With dinitrogen as acceptor
- 25 EC 1.18.99 With H<sup>+</sup> as acceptor
- EC 1.19 Acting on reduced flavodoxin as donor
- EC 1.19.6 With dinitrogen as acceptor
- EC 1.19.6.1 Recommended name: nitrogenase  
(flavodoxin)
- 30 EC 1.97 Other oxidoreductases
- EC 1.97.1.1 chlorate reductase

- EC 1.97.1.2 pyrogallol hydroxyltransferase
- EC 1.97.1.3 sulfur reductase
- EC 1.97.1.4 formate acetyltransferase activating enzyme
- EC 1.97.1.5 arsenate reductase (glutaredoxin)
- 5 EC 1.97.1.6 arsenate reductase (donor)
- EC 1.97.1.7 methylarsonate reductase

EC 2: Transferases - All enzymes that catalyzes a process involving reactions in which groups are transferred belong to this group.

- 10 EC 2.1 Transferring one-carbon groups
  - EC 2.1.1 methyltransferases
  - EC 2.1.2 hydroxymethyl-, formyl- and related transferases
  - EC 2.1.3 carboxyl- and carbamoyltransferases
  - EC 2.1.4 amidinotransferases
- 15 EC 2.2 Transferring aldehyde or ketonic groups
  - EC 2.2.1 transketolases and transaldolases
    - EC 2.2.1.1 transketolase
    - EC 2.2.1.2 transaldolase
    - EC 2.2.1.3 formaldehyde transketolase
    - 20 EC 2.2.1.4 acetoin-ribose-5-phosphate transaldolase
- EC 2.3 Acyltransferases
  - EC 2.3.1 Transferring groups other than amino-acyl groups
  - EC 2.3.2 Aminoacyltransferases
- EC 2.4 Glycosyltransferases
  - 25 EC 2.4.1 Hexosyltransferases
  - EC 2.4.2 Pentosyltransferases
  - EC 2.4.99 Transferring Other Glycosyl Groups
- EC 2.5 Transferring alkyl or aryl groups, other than methyl groups
  - EC 2.5.1 mixed examples
- 30 EC 2.6 Transferring nitrogenous groups
  - EC 2.6.1 Transaminases

- EC 2.6.2 Amidinotransferases
- EC 2.6.3 Oximinotransferases
- EC 2.6.99 Transferring Other Nitrogenous Groups
- EC 2.7 Transferring phosphorus-containing groups
  - 5 EC 2.7.1 Phosphotransferases with an Alcohol Group as Acceptor
  - EC 2.7.2 Phosphotransferases with a carboxyl group as acceptor
  - EC 2.7.3 Phosphotransferases with a nitrogenous group as acceptor
  - 10 EC 2.7.4 Phosphotransferases with a phosphate group as acceptor
  - EC 2.7.5 Phosphotransferases with regeneration of donors, apparently catalysing intramolecular transfers
  - 15 EC 2.7.6 Diphosphotransferases
  - EC 2.7.7 Nucleotidyltransferases
  - EC 2.7.8 Transferases for other substituted phosphate groups
  - EC 2.7.9 Phosphotransferases with paired acceptors
- EC 2.8 Transferring sulfur-containing groups
  - 20 EC 2.8.1 Sulfurtransferases
  - EC 2.8.2 Sulfotransferases
  - EC 2.8.3 CoA-transferases
- EC 2.9 Transferring selenium-containing groups
  - EC 2.9.1 Selenotransferases
  - 25 EC 2.9.1.1 Recommended name: L-seryl-tRNA<sup>Sec</sup> selenium transferase
- EC 3 Hydrolases This group includes any enzyme that catalyzes a process involving cleaving chemical groups with a molecule of water (excluding peptidases, see EC 3.4).
  - 30 EC 3.1 Acting on ester bonds
    - EC 3.1.1 Carboxylic Ester Hydrolases

- EC 3.1.2 Thiolester Hydrolases
- EC 3.1.3 Phosphoric Monoester Hydrolases
- EC 3.1.4 Phosphoric Diester Hydrolases
- EC 3.1.5 Triphosphoric Monoester Hydrolases
- 5 EC 3.1.6 Sulfuric Ester Hydrolases
- EC 3.1.7 Diphosphoric Monoester Hydrolases
- EC 3.1.8 Phosphoric Triester Hydrolases
- EC 3.1.11 Exodeoxyribonucleases Producing 5'-Phosphomonoesters
- 10 EC 3.1.13 Exoribonucleases Producing 5'-Phosphomonoesters
- EC 3.1.14 Exoribonucleases Producing 3'-Phosphomonoesters
- EC 3.1.15 Exonucleases Active with either Ribo- or Deoxyribonucleic Acids and Producing 5'-Phosphomonoesters
- EC 3.1.16 Exonucleases Active with either Ribo- or
- 15 Deoxyribonucleic Acids and Producing 3'-Phosphomonoesters
- EC 3.1.21 Endodeoxyribonucleases Producing 5'-Phosphomonoesters
- EC 3.1.22 Endodeoxyribonucleases Producing other than 5'-Phosphomonoesters
- 20 EC 3.1.25 Site-Specific Endodeoxyribonucleases Specific for Altered Bases
- EC 3.1.26 Endoribonucleases Producing 5'-Phosphomonoesters
- EC 3.1.27 Endoribonucleases Producing other than 5'-Phosphomonoesters
- 25 EC 3.1.30 Endoribonucleases Active with either Ribo- or Deoxyribonucleic Acids and Producing 5'-Phosphomonoesters
- EC 3.1.31 Endoribonucleases Active with either Ribo- or Deoxyribonucleic Acids and Producing 3'-Phosphomonoesters
- EC 3.2 Glycosylases
- 30 EC 3.2.1 Glycosidases, i.e. enzymes hydrolysing O- and S-glycosyl compounds

- EC 3.2.2 Hydrolysing N-Glycosyl Compounds
- EC 3.2.3 Hydrolysing S-Glycosyl Compounds (discontinued)
- EC 3.3 Acting on ether bonds
  - EC 3.3.1 Trialkylsulfonium Hydrolases
  - 5 EC 3.3.2 Ether Hydrolases
- EC 3.4 Acting on peptide bonds (peptidases)
  - 3.4.11 Aminopeptidases
  - 3.4.13 Dipeptidases
  - 3.4.14 Dipeptidyl-peptidases and tripeptidyl-peptidases
  - 10 3.4.15 Peptidyl-dipeptidases
  - 3.4.16 Serine-type carboxypeptidases
  - 3.4.17 Metallo-carboxypeptidases
  - 3.4.18 Cysteine-type carboxypeptidases
  - 3.4.19 Omega peptidases
  - 15 3.4.21 Serine endopeptidases
  - 3.4.22 Cysteine endopeptidases
  - 3.4.23 Aspartic endopeptidases
  - 3.4.24 Metalloendopeptidases
  - 3.4.25 Threonine endopeptidases
  - 20 3.4.99 Endopeptidases of unknown catalytic mechanism
- EC 3.5 Acting on carbon-nitrogen bonds, other than peptide bonds
  - EC 3.5.1 In Linear Amides
  - EC 3.5.2 In Cyclic Amides
  - EC 3.5.3 In Linear Amidines
  - 25 EC 3.5.4 In Cyclic Amidines
  - EC 3.5.5 In Nitriles
  - EC 3.5.99 In Other Compounds
- EC 3.6 Acting on acid anhydrides
  - EC 3.6.1 In Phosphorus-Containing Anhydrides
  - 30 EC 3.6.2 In Sulfonyl-Containing Anhydrides

EC 3.6.3 Acting on acid anhydrides; catalysing transmembrane movement of substances

EC 3.6.4 Acting on acid anhydrides; involved in cellular and subcellular movement.

5 EC 3.7 Acting on carbon-carbon bonds

EC 3.7.1 In Ketonic Substances

EC 3.7.1.1 oxaloacetase

EC 3.7.1.2 fumarylacetoacetase

EC 3.7.1.3 kynureninase

10 EC 3.7.1.4 phloretin hydrolase

EC 3.7.1.5 acylpyruvate hydrolase

EC 3.7.1.6 acetylpyruvate hydrolase

EC 3.7.1.7 b-diketone hydrolase

EC 3.7.1.8 2,6-dioxo-6-phenylhexa-3-enoate hydrolase

15 EC 3.7.1.9 2-hydroxymuconate-semialdehyde hydrolase

EC 3.7.1.10 cyclohexane-1,3-dione hydrolase

EC 3.8 Acting on halide bonds

EC 3.8.1 In C-Halide Compounds

EC 3.9 Acting on phosphorus-nitrogen bonds

20 EC 3.9.1.1 Recommended name: phosphoamidase

EC 3.10 Acting on sulfur-nitrogen bonds

EC 3.10.1.1 N-sulfoglucosamine sulfohydrolase

EC 3.10.1.2 cyclamate sulfohydrolase

EC 3.11 Acting on carbon-phosphorus bonds

25 EC 3.11.1.1 phosphonoacetaldehyde hydrolase

EC 3.11.1.2 phosphonoacetate hydrolase

EC 3.12 Acting on sulfur-sulfur bonds

EC 3.12.1.1 Recommended name: trithionate hydrolase

EC 4 Lyases

30 Lyases are enzymes cleaving C-C, C-O, C-N and other bonds by means other than by hydrolysis or oxidation. They differ from other enzymes in that

two substrates are involved in one reaction direction, but only one in the other direction. When acting on the single substrate, a molecule is eliminated and this generates either a new double bond or a new ring. The systematic name is formed according to 'substrate group-lyase'. In recommended names,  
5 expressions like decarboxylase, aldolase, etc. are used. 'Dehydratase' is used for those enzymes eliminating water. In cases where the reverse reaction is the more important, or the only one to be demonstrated, 'synthase' may be used in the name.

EC 4.1 Carbon-carbon lyases

- 10           EC 4.1.1 Carboxy-Lyases  
              EC 4.1.2 Aldehyde-Lyases  
              EC 4.1.3 Oxo-Acid-Lyases  
              EC 4.1.99 Other Carbon-Carbon Lyases

EC 4.2 Carbon-oxygen lyases

- 15           EC 4.2.1 Hydro-Lyases  
              EC 4.2.2 Acting on Polysaccharides  
              EC 4.2.99 Other Carbon-Oxygen Lyases

EC 4.3 Carbon-nitrogen lyases

- EC 4.3.1 Ammonia-Lyases  
20           EC 4.3.2 Amidine-Lyases  
              EC 4.3.3 Amine-Lyases  
              EC 4.3.99 Other Carbon-Nitrogen Lyases

EC 4.4 Carbon-sulfur lyases

- EC 4.4 Carbon-Sulfur Lyases  
25           EC 4.5 Carbon-Halide Lyases  
              EC 4.6 Phosphorus-Oxygen Lyases  
              EC 4.99 Other Lyases

EC 4.5 Carbon-halide lyases

- EC 4.5.1.1 DDT-dehydrochlorinase  
30           EC 4.5.1.2 3-chloro-D-alanine dehydrochlorinase  
              EC 4.5.1.3 dichloromethane dehalogenase

- EC 4.5.1.4 L-2-amino-4-chloropent-4-enoate  
dehydrochlorinase
- EC 4.5.1.5 S-carboxymethylcysteine synthase
- EC 4.6 Phosphorus-oxygen lyases
  - 5 EC 4.6.1.1 adenylate cyclase
  - EC 4.6.1.2 guanylate cyclase
  - EC 4.6.1.6 cytidylate cyclase
- EC 4.99 Other lyases
  - EC 4.99.1.1 ferrochelataase
  - 10 EC 4.99.1.2 alkylmercury lyase
- EC 5 Isomerases
  - EC 5.1 Racemases and epimerases
    - EC 5.1.1 Acting on Amino Acids and Derivatives
    - EC 5.1.2 Acting on Hydroxy Acids and Derivatives
    - 15 EC 5.1.3 Acting on Carbohydrates and Derivatives
    - EC 5.1.99 Acting on Other Compounds
  - EC 5.2 cis-trans-Isomerases
    - EC 5.2.1.1 maleate isomerase
    - EC 5.2.1.2 maleylacetoacetate isomerase
    - 20 EC 5.2.1.3 retinal isomerase
    - EC 5.2.1.4 maleylpyruvate isomerase
    - EC 5.2.1.5 linoleate isomerase
    - EC 5.2.1.6 furylfuramide isomerase
    - EC 5.2.1.7 retinol isomerase
    - 25 EC 5.2.1.8 peptidylprolyl isomerase
    - EC 5.2.1.9 farnesol 2-isomerase
    - EC 5.2.1.10 2-chloro-4-carboxymethylenebut-2-en-1,4-olide  
isomerase
    - EC 5.2.1.11 4-hydroxyphenylacetaldehyde-oxime isomerase
  - 30 EC 5.3 Intramolecular isomerases
    - EC 5.3.1 Interconverting Aldoses and Ketoses



- EC 5.3.2 Interconverting Keto- and Enol-Groups
- EC 5.3.3 Transposing C=C Bonds
- EC 5.3.4 Transposing S-S Bonds
- EC 5.3.99 Other Intramolecular Oxidoreductases
- 5 EC 5.4 Intramolecular transferases (mutases)
  - EC 5.4.1 Transferring Acyl Groups
  - EC 5.4.2 Phosphotransferases (Phosphomutases)
  - EC 5.4.3 Transferring Amino Groups
  - EC 5.4.99 Transferring Other Groups
- 10 EC 5.5 Intramolecular lyases
  - EC 5.5.1.1 muconate cycloisomerase
  - EC 5.5.1.2 3-carboxy-cis,cis-muconate cycloisomerase
  - EC 5.5.1.3 tetrahydroxypteridine cycloisomerase
  - EC 5.5.1.4 inositol-phosphate synthase
  - 15 EC 5.5.1.5 carboxy-cis,cis-muconate cyclase
  - EC 5.5.1.6 chalcone isomerase
  - EC 5.5.1.7 chloromuconate cycloisomerase
  - EC 5.5.1.8 geranyl-diphosphate cyclase
  - EC 5.5.1.9 cycloeucalenol cycloisomerase
  - 20 EC 5.5.1.10  $\alpha$ -pinene-oxide decyclase
  - EC 5.5.1.11 dichloromuconate cycloisomerase
- EC 5.99 Other isomerases
  - EC 5.99.1.1 thiocyanate isomerase
  - EC 5.99.1.2 DNA topoisomerase
  - 25 EC 5.99.1.3 DNA topoisomerase (ATP-hydrolysing)
- EC 6 Ligases
  - EC 6.1 Forming carbon-oxygen bonds
    - EC 6.1.1 Ligases Forming Aminoacyl-tRNA and Related Compounds
  - 30 EC 6.2 Forming carbon-sulfur bonds
    - EC 6.2.1 Acid-Thiol Ligases

**EC 6.3 Forming carbon-nitrogen bonds**

EC 6.3.1 Acid-Ammonia (or Amide) Ligases (Amide Synthases)

EC 6.3.2 Acid-D-Amino-Acid Ligases (Peptide Synthases)

5 EC 6.3.3 Cyclo-Ligases

EC 6.3.4 Other Carbon-Nitrogen Ligases

EC 6.3.5 Carbon-Nitrogen Ligases with Glutamine as Amido-N-Donor

**EC 6.4 Forming carbon-carbon bonds**

10 EC 6.4.1.1 pyruvate carboxylase

EC 6.4.1.2 acetyl-CoA carboxylase

EC 6.4.1.3 propionyl-CoA carboxylase

EC 6.4.1.4 methylcrotonoyl-CoA carboxylase

EC 6.4.1.5 geranoyl-CoA carboxylase

15 EC 6.5 Forming phosphoric ester bonds

EC 6.5.1.1 DNA ligase (ATP)

EC 6.5.1.2 DNA ligase (NAD)

EC 6.5.1.3 RNA ligase (ATP)

EC 6.5.1.4 RNA-3'-phosphate cyclase

20

**Biological Confirmation - Enzyme Assays**

Also provided by this invention is a cell-free assay to confirm the efficacy of iECTA prodrugs by contacting the prodrug and enzyme in a cell-free system under conditions that favor activation of the prodrug by the enzyme.

25 The enzymes and methods for expression of enzyme nucleic acids are known in the art, and therefore need not be reproduced herein. For example, all enzyme sequence information and reaction conditions are available online at one or more of the following sites: [www.Brenda.bc.uni-koeln.de/](http://www.Brenda.bc.uni-koeln.de/) and [www.expasy.ch/enzyme](http://www.expasy.ch/enzyme). As an example only, coding sequences for bacterial or fungal AcLS and KARI are cloned as described (Pang and Duggleby  
30 (1999); Poulsen and Stougaard (1989); and Hill et al. (1997)) and expressed

in *E. coli* using an appropriate promoter system (Sambrook, et al. *supra*). Enzyme is purified using the "His-tag" system (Stratagene, La Jolla, CA). Enzyme assay for AcLS is done by methods described by Epelbaum, et al. (1998) and others (e.g., Hill, et al. (1997)). Cloning, expression and  
5 purification of KARI is as described by Hill and Duggleby (1999). Assays for KARI will be done similarly to those described by Epelbaum, et al. (1996) and Hill and Duggleby (1999).

This invention provides a method for confirming therapeutic potential for the treatment of infectious disease. The agent is considered a potential  
10 therapeutic agent if proliferation and/or replication of the infectious agent or the host cell are reduced relative to the cells in a control sample. Most preferably, the infectious agent is killed by the agent. Infected cells can be procaryotic (bacterial such as *E. coli*) or eucaryotic. The cells can be mammalian or non-mammalian cells, e.g., yeast cells, murine cells, rat cells,  
15 avian cells, human cells.

This invention also provides a quick and simple screening assay that will enable initial identification of compounds with at least some of the desired characteristics. In one aspect, the assay requires two cell types, the first being a control cell in which the target enzyme is not expressed or does  
20 not contain the infectious agent, or is expressed at a low level. The second cell type is the test cell, in which the target enzyme is expressed at a detectable level, e.g., a high level or a sample that contains the infectious agent. In a separate embodiment, a counterpart genetically modified to differentially express the target enzyme, or enzymes (containing the  
25 appropriate species of target enzyme) is used. More than one species of enzyme can be used to separately transfect separate host cells, so that the effect of the candidate drug on a target enzyme can be simultaneously compared to its effect on another enzyme or a corresponding enzyme from another species.

30 In another embodiment, a third target cell is used as a control because it receives an effective amount of a compound, such as, for example, the

compounds shown below, which have been shown to be potent prodrugs. This embodiment is particularly useful to screen for new agents that are activated by iECTA enzymes.

5           ***In Vivo* Testing for Preclinical Efficacy of iECTA Prodrugs**

The *in vitro* assays are confirmed in animal or plant models infected with a pathogen expressing the target enzyme to determine *in vivo* efficacy. *In vivo* practice of the invention in an animal such as a rat or mouse provides a convenient animal model system that can be used prior to clinical testing of  
10 the therapeutic agent or prodrug. In this system, a potential prodrug will be successful if microbial load is reduced or the symptoms of the infection are ameliorated, each as compared to an untreated, infected animal. It also can be useful to have a separate negative control group of cells or animals which has not been infected, which provides a basis for comparison.

15           When practiced *in vivo*, the candidate prodrug is administered or delivered to the animal in effective amounts. As used herein, the term "administering" for *in vivo* and *ex vivo* purposes means providing the subject with an effective amount of the candidate prodrug effective to reduce microbial load. In these instances, the agent or prodrug may be administered  
20 with a pharmaceutically acceptable carrier. The agents, prodrugs and compositions of the present invention can be used in the manufacture of medicaments and for the treatment of humans and other animals by administration in accordance with conventional procedures, such as an active ingredient in pharmaceutical compositions.

25           Another aspect of this invention is a method for treating a subject or alleviating the symptoms of an infection by a pathogen in a subject, wherein the pathogen or a pathogen infected cell expresses an iECTA enzyme by delivering to the subject an effective amount of an iECTA prodrug compound that is converted to a toxin by the iECTA enzyme. Further provided is a  
30 method of treating a disease associated with an infection with a pathogen expressing an iECTA enzyme, or an infected host cell expressing an iECTA

enzyme, by delivering to the subject an effective amount of an iECTA prodrug compound that is converted to a toxin by the iECTA enzyme.

Examples of iECTA expressing pathogens and the corresponding diseases and symptoms caused by infection by these microorganisms, are provided in

- 5 Table 3, below. Yet further provided is a method for producing a medicament to treat a subject as indicated above, comprising combining an effective amount of a suitable iECTA prodrug and a pharmaceutically acceptable carrier.

10

**Table 3**

<i>iECTA Expressing Microorganism</i>	<i>Disease or Symptom Caused by Infection</i>
<b>Gram-Positive</b>	
<i>Staphylococcus aureus</i>	major human pathogen, bacteremia, pneumonia
<i>Staphylococcus epidermidis</i> and other coagulase-negative staphylococci	urinary tract infections, osteomyelitis, bacteremia
<i>Streptococcus pyogenes</i>	bacteremia, lymphagitis, pneumonia
<i>Streptococcus pneumoniae</i>	pneumonia, otitis media, sinusitis
<i>Streptococcus agalactiae</i>	primary bacteremia, pneumonia, endocarditis, osteomyelitis
<i>Enterococcus species</i>	urinary tract infections, bacteremia, endocarditis, intra-abdominal and pelvic infections, neonatal sepsis
<b>Gram-Negative</b>	
<i>Neisseria gonorrhoeae</i>	genital infection, perihepatitis
<i>Moraxella catarrhalis</i>	otitis media, lower respiratory tract infections, pneumonia, bacteremia
<i>Campylobacter jejuni</i>	acute enteritis, acute colitis, bacteremia
<i>Enterobacteriaceae</i> (including <i>Escherichia</i> , <i>Salmonella</i> , <i>Klebsiella</i> , <i>Enterobacter</i> )	enteric infections, urinary tract infections, respiratory infections, bacteremia
<i>Pseudomonas aeruginosa</i>	endocarditis, respiratory infections, bacteremia, central nervous system infections
<i>Acinetobacter species</i>	respiratory tract infections, bacteremia, genitourinary
<i>Haemophilus influenzae</i>	meningitis, epiglottitis, pneumonia, bacteremia

This invention also provides a method for treating or protecting plants from infection by applying an effective amount of the iECTA prodrug compound to the foliage, roots or the soil surrounding the plants or roots.

- 5 These isolated compounds can be combined with known pesticides or insecticides.

Compounds within the present invention when used to treat or protect plants from infections, they can be formulated as wettable powders, granules and the like, or can be microencapsulated in a suitable medium and the like.

- 10 Examples of other formulations include, but are not limited to soluble powders, wettable granules, dry flowables, aqueous flowables, wettable dispersible granules, emulsifiable concentrates and aqueous suspensions. Other suitable formulations will be known to those skilled in the art.

- This invention further provides a method for administering the  
15 prodrug compound to fish in an amount effective to either prevent or treat an infection. The compound may be administered by incorporating the compound into the food supply for the fish. Alternatively, the compound may be added to the water in which fish live, or are contained within. Finally, the compound may be administered to the fish as a suitable  
20 pharmaceutical preparation. Other suitable formulations will be known to those skilled in the art.

- When the iECTA prodrug compound is delivered to a subject such as a mouse, a rat or a human patient, the agent can be added to a pharmaceutically acceptable carrier and systemically or topically  
25 administered to the subject.

- Animal models that can be used to test utility of candidate iECTA compounds set forth below have been described in the literature. Examples include animal models of infection by *Staphylococcus aureus* (Josefsson and Tartowski (1999) and Totsuka, et al. (1999)), *Pneumocystis carinii*  
30 (Tamburrini, et al. (1999)), enterococci (Zimbelman, et al. (1999)), multimicrobial peritonitis (Montravers, et al. (1999)), and fungal infections

(Louie, et al. (1999)). In each case the candidate iECTA compound is compared with an antibiotic currently used to treat the disease. These experiments also provide the first test of therapeutic index. No toxicity of the candidate iECTA compound should be seen at doses necessary for  
5 eradication or control of disease. Preferably, doses that cause toxicity will be at least ten-fold higher than the doses needed for control or cure of the disease.

Administration *in vivo* can be effected in one dose, continuously or intermittently throughout the course of treatment. Methods of determining  
10 the most effective means and dosage of administration are well known to those of skill in the art and will vary with the composition used for therapy, the purpose of the therapy, the target cell being treated, and the subject being treated. Single or multiple administrations can be carried out with the dose level and pattern being selected by the treating physician. Suitable dosage  
15 formulations and methods of administering the agents can be found below.

The agents and compositions of the present invention can be used in the manufacture of medicaments and for the treatment of humans and other animals by administration in accordance with conventional procedures, such as an active ingredient in pharmaceutical compositions.

20 The pharmaceutical compositions can be administered orally, intranasally, parenterally or by inhalation therapy, and may take the form of tablets, lozenges, granules, capsules, pills, ampoules, suppositories or aerosol form. They may also take the form of suspensions, solutions and emulsions of the active ingredient in aqueous or nonaqueous diluents, syrups, granulates  
25 or powders. In addition to a compound of the present invention, the pharmaceutical compositions can also contain other pharmaceutically active compounds or a plurality of compounds of the invention.

More particularly, a compound of the formula of the present invention also referred to herein as the active ingredient, may be administered for  
30 therapy by any suitable route including oral, rectal, nasal, topical (including transdermal, aerosol, buccal and sublingual), vaginal, parenteral (including

subcutaneous, intramuscular, intravenous and intradermal) and pulmonary. It will also be appreciated that the preferred route will vary with the condition and age of the recipient, and the disease being treated.

In general, a suitable dose for each of the above-named compounds, is  
5 in the range of about 1 to about 100 mg per kilogram body weight of the recipient per day, preferably in the range of about 1 to about 50 mg per kilogram body weight per day and most preferably in the range of about 1 to about 25 mg per kilogram body weight per day. Unless otherwise indicated, all weights of active ingredient are calculated as the parent compound of the  
10 formula of the present invention, for salts or esters thereof, the weights would be increased proportionately. The desired dose is preferably presented as two, three, four, five, six or more sub-doses administered at appropriate intervals throughout the day. These sub-doses may be administered in unit dosage forms, for example, containing about 1 to about 100 mg, preferably  
15 about 1 to above about 25 mg, and most preferably about 5 to above about 25 mg of active ingredient per unit dosage form. It will be appreciated that appropriate dosages of the compounds and compositions of the invention may depend on the type and severity and stage of the disease and can vary from patient to patient. Determining the optimal dosage will generally  
20 involve the balancing of the level of therapeutic benefit against any risk or deleterious side effects of the treatments of the present invention.

Ideally, the prodrug should be administered to achieve peak concentrations of the active compound at sites of disease. This may be achieved, for example, by the intravenous injection of the prodrug, optionally  
25 in saline, or orally administered, for example, as a tablet, capsule or syrup containing the active ingredient. Desirable blood levels of the prodrug may be maintained by a continuous infusion to provide a therapeutic amount of the active ingredient within disease tissue. The use of operative combinations is contemplated to provide therapeutic combinations requiring  
30 a lower total dosage of each component antiviral agent than may be required



when each individual therapeutic compound or drug is used alone, thereby reducing adverse effects.

While it is possible for the prodrug ingredient to be administered alone, it is preferable to present it as a pharmaceutical formulation comprising at least one active ingredient, as defined above, together with one or more pharmaceutically acceptable carriers, therefore, and optionally other therapeutic agents. Each carrier must be "acceptable" in the sense of being compatible with the other ingredients of the formulation and not injurious to the patient.

Formulations include those suitable for oral, rectal, nasal, topical (including transdermal, buccal and sublingual), vaginal, parenteral (including subcutaneous, intramuscular, intravenous and intradermal) and pulmonary administration. The formulations may conveniently be presented in unit dosage form and may be prepared by any methods well known in the art of pharmacy. Such methods include the step of bringing into association the active ingredient with the carrier which constitutes one or more accessory ingredients. In general, the formulations are prepared by uniformly and intimately bringing into association the active ingredient with liquid carriers or finely divided solid carriers or both, and then if necessary shaping the product.

Formulations of the present invention suitable for oral administration may be presented as discrete units such as capsules, cachets or tablets, each containing a predetermined amount of the active ingredient; as a powder or granules; as a solution or suspension in an aqueous or non-aqueous liquid; or as an oil-in-water liquid emulsion or a water-in-oil liquid emulsion. The active ingredient may also be presented a bolus, electuary or paste.

A tablet may be made by compression or molding, optionally with one or more accessory ingredients. Compressed tablets may be prepared by compressing in a suitable machine the active ingredient in a free-flowing form such as a powder or granules, optionally mixed with a binder (e.g., povidone, gelatin, hydroxypropylmethyl cellulose), lubricant, inert diluent,

preservative, disintegrant (e.g., sodium starch glycolate, cross-linked povidone, cross-linked sodium carboxymethyl cellulose) surface-active or dispersing agent. Molded tablets may be made by molding in a suitable machine a mixture of the powdered compound moistened with an inert liquid diluent. The tablets may optionally be coated or scored and may be formulated so as to provide slow or controlled release of the active ingredient therein using, for example, hydroxypropylmethyl cellulose in varying proportions to provide the desired release profile. Tablets may optionally be provided with an enteric coating, to provide release in parts of the gut other than the stomach.

Formulations suitable for topical administration in the mouth include lozenges comprising the active ingredient in a flavored basis, usually sucrose and acacia or tragacanth; pastilles comprising the active ingredient in an inert basis such as gelatin and glycerin, or sucrose and acacia; and mouthwashes comprising the active ingredient in a suitable liquid carrier.

Pharmaceutical compositions for topical administration according to the present invention may be formulated as an ointment, cream, suspension, lotion, powder, solution, paste, gel, spray, aerosol or oil. Alternatively, a formulation may comprise a patch or a dressing such as a bandage or adhesive plaster impregnated with active ingredients and optionally one or more excipients or diluents.

For diseases of the eye or other external tissues, e.g., mouth and skin, the formulations are preferably applied as a topical ointment or cream containing the active ingredient in an amount of, for example, about 0.075 to about 20% w/w, preferably about 0.2 to about 25% w/w and most preferably about 0.5 to about 10% w/w. When formulated in an ointment, the prodrug may be employed with either a paraffinic or a water-miscible ointment base. Alternatively, the prodrug ingredients may be formulated in a cream with an oil-in-water cream base.

If desired, the aqueous phase of the cream base may include, for example, at least about 30% w/w of a polyhydric alcohol, i.e., an alcohol

having two or more hydroxyl groups such as propylene glycol, butane-1,3-diol, mannitol, sorbitol, glycerol and polyethylene glycol and mixtures thereof. The topical formulations may desirably include a compound which enhances absorption or penetration of the prodrug ingredient through the skin or other affected areas. Examples of such dermal penetration enhancers include dimethylsulfoxide and related analogues.

The oily phase of the emulsions of this invention may be constituted from known ingredients in a known manner. While this phase may comprise merely an emulsifier (otherwise known as an emulgent), it desirably comprises a mixture of at least one emulsifier with a fat or an oil or with both a fat and an oil. Preferably, a hydrophilic emulsifier is included together with a lipophilic emulsifier which acts as a stabilizer. It is also preferred to include both an oil and a fat. Together, the emulsifier(s) with or without stabilizer(s) make up the so-called emulsifying wax, and the wax together with the oil and/or fat make up the so-called emulsifying ointment base which forms the oily dispersed phase of the cream formulations.

Emulgents and emulsion stabilizers suitable for use in the formulation of the present invention include Tween 60, Span 80, cetostearyl alcohol, myristyl alcohol, glyceryl monostearate and sodium lauryl sulphate.

The choice of suitable oils or fats for the formulation is based on achieving the desired cosmetic properties, since the solubility of the active compound in most oils likely to be used in pharmaceutical emulsion formulations is very low. Thus, the cream should preferably be a non-greasy, non-staining and washable product with suitable consistency to avoid leakage from tubes or other containers. Straight or branched chain, mono- or dibasic alkyl esters such as di-isoadipate, isocetyl stearate, propylene glycol diester of coconut fatty acids, isopropyl myristate, decyl oleate, isopropyl palmitate, butyl stearate, 2-ethylhexyl palmitate or a blend of branched chain esters known as Crodamol CAP may be used, the last three being preferred esters. These may be used alone or in combination depending on the properties

required. Alternatively, high melting point lipids such as white soft paraffin and/or liquid paraffin or other mineral oils can be used.

Formulations suitable for topical administration to the eye also include eye drops wherein the active ingredient is dissolved or suspended in a suitable carrier, especially an aqueous solvent for the prodrug ingredient. The prodrug ingredient is preferably present in such formulation in a concentration of about 0.5 to about 20%, advantageously about 0.5 to about 10% particularly about 1.5% w/w.

Formulations for rectal administration may be presented as a suppository with a suitable base comprising, for example, cocoa butter or a salicylate.

Formulations suitable for vaginal administration may be presented as suppositories, tampons, creams, gels, pastes, foams or spray formulations containing in addition to the prodrug ingredient, such carriers as are known in the art to be appropriate.

Formulations suitable for nasal administration, wherein the carrier is a solid, include a coarse powder having a particle size, for example, in the range of about 20 to about 500 microns which is administered in the manner in which snuff is taken, i.e., by rapid inhalation through the nasal passage from a container of the powder held close up to the nose. Suitable formulations wherein the carrier is a liquid for administration as, for example, nasal spray, nasal drops, or by aerosol administration by nebulizer, include aqueous or oily solutions of the prodrug ingredient.

Formulations suitable for parenteral administration include aqueous and non-aqueous isotonic sterile injection solutions which may contain anti-oxidants, buffers, bacteriostats and solutes which render the formulation isotonic with the blood of the intended recipient; and aqueous and non-aqueous sterile suspensions which may include suspending agents and thickening agents, and liposomes or other microparticulate systems which are designed to target the compound to blood components or one or more tissues. The formulations may be presented in unit-dose or multi-dose sealed

containers, for example, ampoules and vials, and may be stored in a freeze-dried (lyophilized) condition requiring only the addition of the sterile liquid carrier, for example water for injections, immediately prior to use.

Extemporaneous injection solutions and suspensions may be prepared from  
5 sterile powders, granules and tablets of the kind previously described.

Preferred unit dosage formulations are those containing a daily dose or unit, daily subdose, as herein above-recited, or an appropriate fraction thereof, of a prodrug ingredient.

It should be understood that in addition to the ingredients particularly  
10 mentioned above, the formulations of this invention may include other agents conventional in the art having regard to the type of formulation in question, for example, those suitable of oral administration may include such further agents as sweeteners, thickeners and flavoring agents.

Prodrugs and compositions of the formula of the present invention  
15 may also be presented for the use in the form of veterinary formulations, which may be prepared, for example, by methods that are conventional in the art.

### **Agricultural Applications**

20 Some embodiments are useful in agriculture. Accordingly, this invention also provides a composition comprising the compound of this invention and a carrier, such as a solvent or agriculturally suitable carrier. In a further embodiment, the composition includes at least one chemical or biological pesticide, or both, as is conventionally used in the art.

25 For ease of application to plants or plant roots, the formulations can be processed into a formulation selected from the group consisting of a wettable powder, an aqueous suspension, an emulsifiable concentrate and a microencapsulated formulation.

Thus, the compounds of this invention can be used in a method for  
30 protecting or treating a plant or plant root from pathogenic infestations by applying an effective amount of the compound to the plant or root. In one

aspect, the method further comprises applying at least one chemical or biological pesticide.

The following examples are intended to illustrate, but not limit the invention.

5

### **Experiment # 1 – Identification of iECTA Enzyme Targets**

#### **Alternative #1**

The query method involves:

1. Go to WIT (“What Is There”) site on the Internet: At the time of  
10 the filing of this application, the WIT site was at the URL,  
<http://wit.mcs.anl.gov/WIT2/CGI/search.cgi?user=>.
2. Select “General Search,” check “All Enzymes,” and select “Match the Exact String” “.” (i.e. consisting only of a full stop). This will output all EC numbers in the microbial database when the maximum output table  
15 length is specified to be greater than the then-current maximum EC number. For example, as of the filing of the first priority application on July 20, 2000, there were 3,546 enzymes listed in the EC database. The entire list of EC numbers could be output, therefore, by specifying the maximum output table length as any number greater than or equal to 3,546 (e.g., 10,000).
- 20 3. Select and copy all EC numbers and enzyme names to a Microsoft Word (or similar) document, and sort the EC numbers in order to get a useful list of names.
4. Paste the EC numbers and enzyme names into the KEGG form at:  
[http://www.blast.genome.ad.jp/kegg-bin/mk\\_point\\_html?ec](http://www.blast.genome.ad.jp/kegg-bin/mk_point_html?ec). This will  
25 search enzymes in the pathway database by EC numbers.
5. Select “Homo sapiens” from the pull-down menu and choose to “Display EC number(s) NOT found in the search.” This will output a list of enzymes identified by EC numbers, as well as a list of enzyme names. This initial output indicates the input enzymes on the KEGG metabolic map  
30 outlined in red that are characterized as NOT being present in human cells. Input enzymes that are present in human cells are outlined in red with a green

fill. Because the descriptions of all genomes are incomplete at present, this is a list of candidate iECTA targets present in non-human species.

**Alternative #2** (as shown in Figure 2C):

- 5 1. Go to Genomes Online Homepage, ERGO, on the internet:
2. <http://wit.integratedgenomics.com/IGwit/CGI/examine.cgi?user=>
3. Select general search, select a target organism or homo sapiens  
select ORFS (open reading frames), and select match EC" " (i.e., EC  
space). This will output all EC numbers in the microbial database  
10 corresponding to the target organism when the maximum output table  
length is selected to be 10,000. In the example, the list for individual  
pathogenic organisms have been combined to give a list consisting of  
8,162 open reading frames that have been annotated as enzymes with  
defined EC numbers. This list can be copied and pasted into the  
15 KEGG form as described in step 4 of Alternative #1 in order to obtain  
a metabolic map with pathogen enzymes outlined in red, and human  
enzymes filled with green.

**Alternative #3** (as shown in Figure 2C):

- 20 1. Go to WIT (What Is There) site on the internet:
2. <http://wit.mcsanl.gov/WIT2/CGI/search.cgi?user=>
3. Select general search, select a target organism, select ORFS (open  
reading frames), and select match EC" " (i.e., EC space). This will  
output all EC numbers in the microbial database corresponding to the  
25 target organism when the maximum output table length is selected to  
be 10,000. For example, the list for individual pathogenic organisms  
have been combined to give a list consisting of 8,162 open reading  
frames that have been annotated as enzymes with defined EC  
numbers. Alternatively, a separate list of EC numbers can be compiled  
30 for each organism individually by selecting a single organism at a  
time.

4. Open the file as a Microsoft Word (or similar word processing program), and process the text until the EC numbers are listed in a column separated by linefeed characters. This can be done (for example), by using the Replace function of the word processor to replace "EC" with "^lEC" to list all EC numbers at the left margin, and to replace all whitespace.
5. Next, set the indentation to place all EC numbers in a column. Select the column, copy and paste to a new document. Delete "(EC" using the Replace function of the word processor program, delete all spaces, and replace all instances of "^ l^l" with "^l". Likewise, replace all instances of "^p^p" with "^p".
6. Copy the resulting column of numbers to a Simpletext or other text based word processor file that is recognized by a PERL or other computer language interpreter, and name the file "target\_ec\_num".
7. Go to the SRS data integration page maintained by the European Bioinformatics Institute currently at <http://srs6.ebi.ac.uk/srs6bin/cgi-bin/wgetz?-page+top+-newId>. Use the SRS interface to query a database representing enzymes expressed in humans. For example, the BRENDA database can be downloaded in this way by querying for [Organism] Human|homo sapiens AND [EC number]\*. The resulting list of EC numbers is most conveniently saved as a text file, opened in Microsoft Word (or similar word processing program) and processed as in steps 3) through 6) above; save the final text file as human\_ec\_num.
8. A list of enzymes occurring in the target organism, but not in humans, or other species or combination of species can be obtained by running a computer program written in PERL or other computer language. The program can be re-run to delete enzymes present in any number of databases by re-applying step 8) using another database. For example, the SwissProt database human enzymes can be subtracted as



well as the BRENDA database. Alternatively, the SwissProt and BRENDA lists can be combined, and the program run just once.

The following illustrative PERL program was used to obtain the list of enzymes set forth in step 8:

```

5      To delete known human enzymes, as represented by enzyme
      commission (EC numbers) from lists of enzyme commission numbers
      comprising a number of pathogenic microorganisms. In this example, the
      lists of EC numbers for pathogenic organisms and Homo sapiens were
      downloaded from the Integrated Genomics website
10     (http://wit.integratedgenomics.com/GOLD/), the website for the European
      Bioinformatics Institute (http://www.ebi.ac.uk/genomes/).

      #!/usr/bin/perl;

      open (HUMAN_EC_NUM, "human_ec_num"); # input human EC numbers
15     while (<HUMAN_EC_NUM>) {
        chomp;

        push (@human_ec_list, $_); #store the numbers in a list
      }

20     open (TARGET_EC_NUM, "target_ec_num"); #input target EC numbers
      while (<TARGET_EC_NUM>) {
        chomp;

        push (@target_ec_list, $_); #store target EC numbers in a list
      }

25     while (@human_ec_list) { #compare each human EC number with
        $a = pop (@human_ec_list); #each target EC number

        foreach (@target_ec_list) {
          if ($_ eq $a) {          #if the the target EC number matches
            s/$a/ERGO/;           #replace with the string ERGO
30      }
        }
      }

      print "ECTA EC numbers are: \n"; #print the list to the screen
      open (OUT, ">target_ec_numbers"); #save the list to a file
35     foreach (@target_ec_list) {
        print (OUT $_);

```

```

    print (OUT "\n");
    print "$_ \n";
}
close (OUT) ||die "can't close";

```

5

The output of the program in step 8 lists all ECTA targets, whether or not they are part of a recognized metabolic pathway; enzymes present in BRENDA (Homo sapiens and other mammals, in this instance) and SwissProt (Homo sapiens) can be indicated.

10 A list of enzymes organized into metabolic pathways can be obtained from the resulting total target\_ec\_num\_list by pasting this list into the KEGG website <http://www.blast.genome.ad.jp/kegg/kegg2.html>, selecting the organism homo sapiens, selecting Display EC/Compound/Gene(s) NOT found in the search, and clicking execute. ECTA enzymes that cannot be  
15 placed in a metabolic pathway by KEGG will be listed apart from those organized into metabolic pathways.

#### Alternative #4

1. Download the list of all existing EC numbers defined by the  
20 International Union of Biochemistry and Molecular Biology. For example, the current list can be obtained by going to the nomenclature site of the IUBMC at <http://www.chem.qmw.ac.uk/iubmb/>, and saving a text file containing a list of each of the six enzyme categories, concatenating these files, then removing all characters from the file  
25 except the EC numbers using a wordprocessing program such as Microsoft Word.
2. "Dehumanize" the list of EC numbers by subtracting ERGO human EC numbers, BRENDA human EC numbers, and SwissProt human EC numbers by running the PERL program listed in  
30 Alternative #2 to delete human EC numbers.

3. Identify microbial enzymes by using the "dehumanized" EC number list to select "hits" in a file created by concatenating the annotated EC numbers and enzyme descriptions for target organisms (alternatively, each target organism can be analyzed individually). In this example, a file consisting of the EC numbers and descriptions comprising 51 microbial genomes representing human microbial pathogens is first catenated with the following PERL script:

```
#!/usr/bin/perl -w

#catenates text files listed below:

10 @ARGV = ("Yersinia pseudotubercul", "Yersinia pestis", "Vibrio cholerae
    El Tor N16961", "Ureaplasma urealyticum", "Treponema pallidum", "
    Streptomyces coelicolor", " Streptomyces coelicolor", "Streptococcus
    pyogenes", "Streptococcus pneumonia", "Streptococcus mutans",
15 "Streptococcus equi", "Staphylococcus aureus", "Salmonella typhimurium",
    "Salmonella typhi", "Salmonella paratyphi", "Salmonella enteritidis",
    "Salmonella dublin", "Saccharomyces cerevisia", "Rickettsia prowazekii",
    "Pseudomonas aeruginosa", "Porphyromonas gingivalis", "Pasteurella
    multocida", "Neurospora crassa", "Neisseria meningitidis ser. B ", "Neisseria
    meningitidis ser. A ", "Neisseria gonorrhoeae", "Mycoplasma pneumoniae",
20 "Mycoplasma genitalium", "Mycobacterium tuberculosis", "Mycobacterium
    leprae", "Mycobacterium bovis", "Klebsiella pneumoniae", "Helicobacter
    pylori", "Helicobacter pylori J99", "Haemophilus influenzae", "Haemophilus
    ducreyi", "Escherichia coli", "Enterococcus faecium (DOE)", "Enterococcus
    faecalis", "Corynebacterium diphthe", "Clostridium difficile", "Clostridium
25 acetobutyli", "Chlamydia trachomatis D", " Chlamydia trachomatis M",
    "Chlamydia pneumoniae AR39", "Chlamydia pneumoniae CWL029",
    "Campylobacter jejuni", "Borrelia burgdorferi", "Bordetella pertussis",
    "Bordetella bronchiseptica", "Bacillus subtilis");

    open (OUT, ">outfile"); #Outfile is the catenated file

30 while (<>) {

        print $_;

        print OUT $_;

    }

35 Close (OUT)||die "can't close";
```

4. Once the files containing EC numbers and enzyme descriptions for target microorganisms are catenated, the enzymes not occurring in humans can be selected by running another PERL program using the "dehumanized" EC numbers as input (EC numbers are converted from 1.1.1.1 to 1\_1\_1\_1 format by replacing "." with "\_" before running this program):

```
#!/usr/bin/perl -w

10  #This program outputs EC Enzyme Descriptions for microorganisms, as
    shown in 5a

    #The EC numbers represent enzymes that do not occur in humans

15  open (TARGET_EC_NUM, "Dehuman EC nums clean");
    open (OUT, ">All pathogen ECTA LIST");
    while (<TARGET_EC_NUM>) {
        chomp;

20          push (@target_ec_list, $_);
        }

        %seen = ();

25  foreach $item (@target_ec_list) {
            push (@uniq, $item) unless $seen{$item}++;
        }

30  @target_ec_list = @uniq;
    @target_ec_list = reverse(@target_ec_list);

    while (@target_ec_list) {

35          $a = pop (@target_ec_list);

        open (PATHOGEN_EC_LIST, "KITTY EC LIST TEXT copy");
        while (<PATHOGEN_EC_LIST>) {

40          if (/^b$a\b/) {
```

```

        print "$a $ _";
        print OUT "$a $ _";
5      }
      }

    }

10   close (OUT) ||die "can't close";

```

The output of this program is given in Figure 7A, which lists the EC numbers and descriptions of ECTA enzymes for each target organism. An abbreviated list consisting of all the EC number descriptions, but listing only one occurrence for each organism is shown in Figure 7B, and consists of the 673 enzymes indicated by the following PERL script:

```

#!/usr/bin/perl -w

20   open (TARGET_EC_NUM, "Dehuman EC nums clean");
    open (OUT, ">All pathogen ECTA LIST");
    while (<TARGET_EC_NUM>) {
        chomp;

25         push (@target_ec_list, $ _);
    }

    %seen = ();

30   foreach $item (@target_ec_list) {
        push (@uniq, $item) unless $seen{$item}++;
    }

35   @target_ec_list = @uniq;
    @target_ec_list = reverse(@target_ec_list);

    while (@target_ec_list) {

40         $a = pop (@target_ec_list);
        $b = $a;

```

```

open (PATHOGEN_EC_LIST,"KITTY EC LIST TEXT copy");
    while (<PATHOGEN_EC_LIST>) {

    if ($a eq $b){
5   if (/^b$a\b/) {

        print "$a $_";
        print OUT "$a $_";
10      b = $_;

    }
    }
    }
15 }

close (OUT) || die "can't close";

```

20 The methods of this invention provide the following unexpected advantages over prior art methods:

1. By taking the intersection of data sets from two different sources, a new data set is generated with useful properties that may contain enzymes or enzyme types that are present in pathogenic or undesirable microorganisms, but not present in uninfected or host cells.
- 25 2. Although the method makes use of an existing data set that returns enzyme names and EC numbers in response to a search tool, the use of a computer algorithm to return all enzyme names which identify potential iECTA enzyme targets, by EC number, in pathogenic organisms is an innovation that can be broadly applied for identifying pathogen or species
 

30 targets for therapeutics development, or other applications (e.g., discriminating between yeast and bacteria, and pathogenic vs. nonpathogenic bacteria, plant pests vs. food plants).
3. Because the data sets for total microbial enzymes are subject to change as new enzyme genes are discovered, the method described above can
 

35 continue to identify "new" iECTA targets.

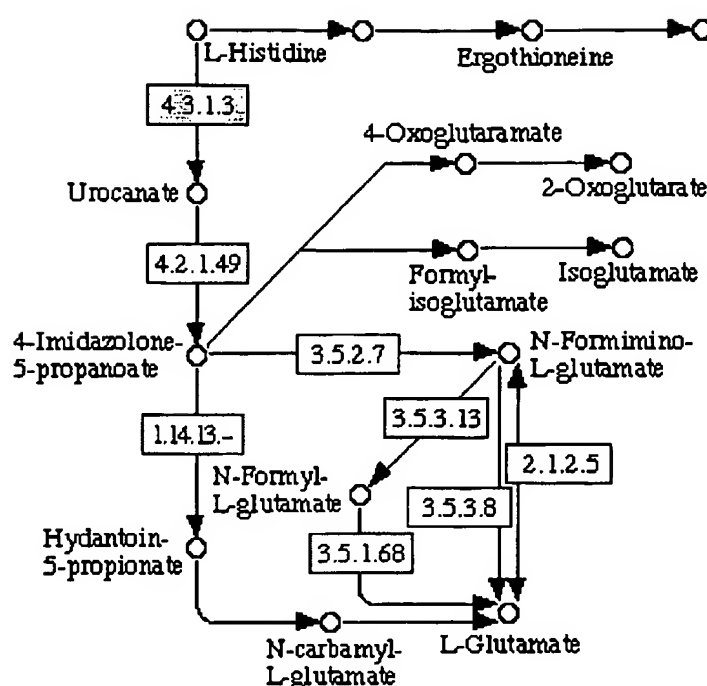
Although the method has been illustrated by examples applicable to iECTA, the method is not limited to iECTA. For example, databases of

enzymes elevated or expressed only in human cancer cells as compared to normal cells can be identified in an analogous fashion. For example, target enzymes for ECTA in cancer are expressed at elevated levels in tumor tissue as compared to normal tissue. Examples of such enzymes are given in Table 1(A). The difference in target enzyme expression between normal and tumor tissue allows for a positive therapeutic index to be achieved with ECTA compounds. Using this approach, the ECTA compound NB1011 (See U.S. Patent No. 6,245,750) targets the enzyme thymidylate synthase (TS) which is overexpressed in cancer cells. Cytotoxicity of NB1011 is proportional to TS protein levels in model cell-based systems. TS inhibitors such as 5-fluorouridine have the reverse cytotoxicity profile since they are more toxic to the cells which express low amounts of the enzyme (Copur et al., 1995). *In vivo* studies have demonstrated efficacy against colon and breast cancer in animal models with little or no toxicity to the host.

15

### **Experiment # 2 -Analysis of Metabolic Networks**

In selecting ECTA target enzymes it is useful to analyze the metabolic pathways and the networks of pathways in which particular potential target enzymes occur. For example, imidazolone propionase is shown here to be on the metabolic map relating to histidine degradation, in which boxes colored green (present as shaded in black and white reproductions) represent enzymes known (according to current information represented in the Kyoto Encyclopedia of Genes and Genomes) to occur in humans, and the proposed target enzyme, 3.5.2.7.



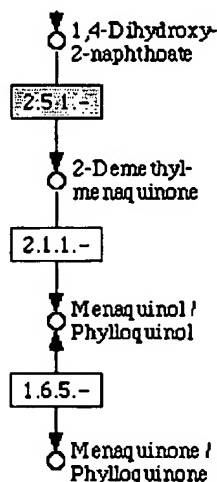
This map illustrates an aspect of ECTA enzyme selection, i.e. that it is desirable for the ECTA target enzyme to be connected to the network in such a way that there are no enzymes occurring in humans that are connected to the substrate (in this case, 4-imidazolone 5-propionate). This ensures that any ECTA substrate is unlikely to interact with a human enzyme. This condition is met in the above example, since 4.2.1.49 and 1.14.13- are both represented by unfilled boxes. EC numbers 4.3.1.3; 4.2.1.49; 1.14.13-; 3.5.2.7; 3.5.1.68 and 3.5.3.8 have been identified with open reading frames in *P. aeruginosa* according to the WIT database, while only 4.3.1.3 was also found in humans.

Another example of selection of an intrinsic ECTA target by identification of an enzyme that catalyzes a favorable reaction type is methyl transferase. The methyl transferase enzyme thymidylate synthase has been shown to be amenable to development of ECTA substrates. A search of the WIT database for alternative related enzymes identified 2-demethylmenaquinone methyl transferase, EC 2.1.1.- as a potential intrinsic ECTA target.



In bacteria, the S-adenosylmethionine dependent 2-demethylmenaquinone methyl transferase catalyzes a step in the biosynthesis of menaquinone, or vitamin K<sub>2</sub>. A number of pathogenic bacteria express this enzyme, including *Escherichia coli*, *Enterococcus faecalis*, *Haemophilus influenza*, *Mycobacterium leprae*, *Mycobacterium tuberculosis*, *Pseudomonas aeruginosa*, and *Yersinia pestis*. The reaction catalyzed by this enzyme involves the transfer of a methyl group, and is similar in this respect to thymidylate synthase, EC 2.1.1.45.

A tBLASTn search indicates that there is no human gene in the TIGR (The Institute for Genomic Research) human gene index that has a statistically significant degree of similarity to the S-adenosylmethionine dependent 2-demethylmenaquinone methyl transferase. This result is also consistent with the pathway data obtained from the Kyoto Encyclopedia of Genes and Genomes.



Enzyme EC 2.1.1.- is present in the target organism (*Pseudomonas aeruginosa*), but not in humans. 2.5.1.- represents an enzyme that is present in humans. The pathway has no branches, thus the substrate 2-demethylmenaquinone is not expected to be a substrate for any human enzymes and is a useful target for development of ECTA compounds.

### **Experiment # 3 - Designing iECTA Compounds for Bacterial and Fungal Infections Using Enzymes in the Branched Chain Amino Acids Pathway**

Using the above method, the enzymes acetolactate synthase (AcLS) or  
5 ketol-acid reductoisomerase (KARI) were identified as target enzymes.  
These two enzymes are preferred targets for iECTA because they are specific  
to the Branched Chain Amino Acid ("BCAA") pathway which itself is  
specific to bacteria, fungi, and plants. Acetolactate synthase (AcLS) is the  
first enzyme in the pathway of branched chain amino acid (BCAA) synthesis.  
10 The active enzyme is present in bacteria, fungi, and plants, but not in  
mammals (Shaner and Singh (1997)). The absence of AcLS in animals  
allows effective use of AcLS inhibitors in herbicides, while avoiding toxicity  
to humans and animals (Shaner and Singh (1997) and Grandoni, et al.  
(1998)). Selectivity of enzyme function between disease causing organisms  
15 and animal or plant hosts can be used for designing iECTA compounds to  
fight bacterial and fungal infections. The product(s) may include toxins or  
antimetabolites that are preferentially generated by the bacteria or fungi.

Acetolactate synthase (AcLS) is an  $\alpha_2\beta_2$  oligomer that consists of  
four subunits: two catalytic subunits with molecular weight of 60 kD and two  
20 regulatory subunits with molecular weight of 10-17 kDa (Pang and Duggleby  
(1999)). The enzyme catalyzes two similar reactions: the condensation of  
two pyruvate molecules to yield 2-acetolactate (Figure 11), and the  
condensation of pyruvate with 2-oxobutyrate (2-OB, 2-ketobutyrate) to yield  
2-aceto-2-hydroxybutyrate (Figure 12). Thiamine pyrophosphate (TPP) is a  
25 cofactor in the reaction. Another cofactor, flavin adenine dinucleotide  
(FAD), is also necessary to maintain the catalytic structure of the enzyme  
(Shaner and Singh (1997)). The mechanism of AcLS reactivity with  
pyruvate and 2-OB is shown in Figure 5. Figure 6 is a comparison of 2-OB  
metabolism in E. coli and humans. AcLS is inhibited by BCAA feedback  
30 inhibition and a number of heterocyclic compounds, some of which are  
currently used as herbicides (Figure 10) (Shaner and Singh (1997)). The

crystal structure of AcLS is not yet available, but molecular modeling of the AcLS active site based on the structure of AcLS homologues, including pyruvate decarboxylase and pyruvate oxidase, has been completed (Ibdah, et al. (1996) and Chipman, et al. (1998)). Results show the existence of a deep substrate binding pocket with the cofactor binding at the bottom of the pocket. Site directed mutagenesis revealed that some herbicides (e.g., sulfonylurea; Figure 10) bind close to the "entrance" of the pocket (Chipman, et al. (1998) and Chang and Duggleby (1998)). Branched chain amino acids inhibit the enzyme by an allosteric mechanism since they do not occupy the substrate binding site, but rather a distinct site between the two subunits (Shaner and Singh (1997)). AcLS inhibitors are effective as herbicides at low concentrations and have little toxicity to humans (Whitcomb (1999)).

KARI follows AcLS in the pathway of branched chain amino acid synthesis. It catalyzes isomerization of 2-acetolactate or 2-aceto-2-hydroxybutyrate with concomitant hydride transfer. The products of the reaction are 2,3-dihydroxy-isovalerate and 2,3-dihydroxy-3-methyl-valerate, respectively. The mechanism of the reaction is known in the art (Aulabaugh and Schloss (1990)). For catalysis, the enzyme requires  $Mg^{2+}$ , which is involved in substrate binding, and NADPH, which is necessary to carry out the reductase function of KARI. KARI inhibitors include analogs of the transition state of the reaction (Halgand, et al. (1999)). Because the crystal structure of KARI is known (Halgand, et al. (1999)), this information can be used to aid the design of KARI iECTA compounds using simulated docking technology (Kirkpatrick, et al. (1999)).

25

#### **Experiment # 4 - Designing iECTA Prodrugs to Target Enzymes**

The following discussion is intended to illustrate, but not limit the invention. The natural substrates for AcLS are pyruvate or 2-oxobutyrate (2-OB). In designing possible iECTA molecules to target AcLS, the principal substrates and cofactors that are involved in the reaction were analyzed with respect to the criteria listed in Figures 2A and 2B and the metabolism of 2-

30

OB in humans and *E. coli* were compared. Modifications of 2-oxobutyrate may be good candidates for AcLS ECTA compounds. 2-oxobutyrate (2-OB) is involved in few defined pathways. AcLS catalyzes condensation of 2-OB with the pyruvate in the first step in branched chain amino acid synthesis giving rise to Isoleucine. To enter this pathway a 2-OB derivative is required that is not significantly toxic by itself but can become toxic following reaction with AcLS. One possible fate of the product of the AcLS reaction with its ECTA molecule is that it can act as an inhibitor of ketol acid reductoisomerase (KARI), the next enzyme in the pathway of BCAA synthesis. Alternatively, ECTA compounds like derivatives of 2-OB may be incorporated into proteins by organisms with active AcLS. This would result in pathogen-specific metabolic poisoning of the pathogen (bacteria, yeast) and may also be effective for herbicidal activity. A summary of this analysis is given in Table 3, below.

15

Table 4: Possible Pyrimidyl Compounds to Be Used as ECTA Compounds for AcLS

Reactant	Potential as an ECTA Substrate	Rationale
Thiamine pyrophosphate (TPP-cofactor)	Limited	Lack of specificity. TPP interacts with multiple enzymes, including enzymes present in animals. Alternatives in TPP could therefore impact host systems.
Branched chain amino acids	Limited	Natural product. More likely to inhibit the reaction of AcLS.
AcLS inhibitors (Herbicides): <ul style="list-style-type: none"> <li>• Imidazolinones</li> <li>• Pyrimidylthio-benzoates</li> <li>• Sulfonylamino-carbonyltriazolinones</li> <li>• Sulfonylureas</li> </ul>	Limited	Not processed into product by AcLS.
Pyruvate	Limited	Good substrate since it undergoes decarboxylation on the first step of reaction. In the normal pathway, A) two molecules of pyruvate are condensed in the first step of the BCAA pathway which gives rise to Valine; and B) one

Reactant	Potential as an ECTA Substrate	Rationale
		molecule is combined with a molecule of 2-oxobutyrate to give rise to Isoleucine. However, it is a "common substrate" in the cell, is involved in many metabolic pathways (reacts with at least 10 different enzymes including enzymes present in mammals).
2-oxobutyrate (2-OB)	A leading candidate as scaffold for AcLS ECTA compound	Modifications of 2-oxobutyrate may be good candidates for AcLS ECTA compounds. 2-oxobutyrate (2-OB) is involved in few defined pathways. AcLS catalyzes condensation of 2-OB with the pyruvate in the first step in branched chain amino acid synthesis giving rise to Isoleucine. To enter this pathway we need a 2-OB derivative that is not significantly toxic by itself but can become toxic following reaction with AcLS. One possible fate of the product of the AcLS reaction with its ECTA molecule is that it can act as an inhibitor of ketol acid reductoisomerase (KARI), the next enzyme in the pathway of BCAA synthesis. Alternatively, ECTA compounds like derivatives of 2-OB may be incorporated into proteins by organisms with active AcLS. This would result in pathogen-specific metabolic poisoning of the pathogen (bacteria, yeast) and may also be effective for herbicidal activity.

Such iECTA compounds will have therapeutic antimicrobial (and possible herbicidal) properties. Proposed pathways of metabolism for AcLS iECTA compounds derived from 2-OB are compared for humans and

5 bacteria as shown in Figure 6. In humans and bacteria, cystathionine-2-lyase catalyzes 2-oxobutyrate conversion to L-homoserine and L-cystathionine. In bacteria, two additional enzymatic reactions can occur. These are reactions of 2-OB with 1-aminocyclopropane-1-carboxylate deaminase and acetolactate synthase. The structure of a potential AcLS iECTA compound is

10 disclosed *infra*. The tri-substitution of carbon-4 of 2-OB, where carbon-4 is CX<sub>3</sub> and where X ≠ H, is one of the key features in this design because it

channels the iECTA compound toward reaction with AcLS, and prevents its reaction with cystathionine-2-lyase or 1-aminocyclopropane-1-carboxylate deaminase.

Once the iECTA compound is processed by AcLS, the fate of the product of the reaction may be different from that of the natural substrate. The AcLS iECTA product may:

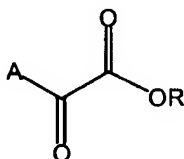
1. Bind to KARI and be converted to the rearranged and reduced product. This product could be toxic, or become transformed to a toxin following a subsequent reaction.
2. It may not bind to KARI, but rather accumulate as a "dead-end" product and eventually starve the cells of pyruvate.
3. Be incorporated into cellular polypeptides, thereby leading to the formation of dysfunctional proteins.

The design of candidate KARI iECTA compounds is based upon the same rationale as the design of AcLS iECTA compounds. In this case, the proposed scaffold is 2-aceto-2-hydroxybutyrate.

Either AcLS or KARI will utilize substrates and convert them to antimetabolites targeting multiple enzyme pathways.

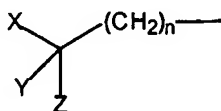
#### Experiment # 5 - Synthesis of iECTA Compounds

This invention also provides compounds useful as AcLS and KARI iECTA compounds. In one aspect, the compounds have the structure:



wherein A is a substituted or unsubstituted phenyl ring; or a substituted

$>C=C<$  more preferably  $-CH=CH-$ , substituents can include a substituted or unsubstituted aromatic or heteraromatic ring, more preferably a substituted or unsubstituted phenyl ring; or



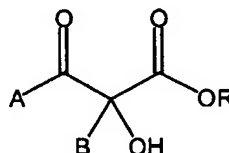
5

wherein  $n$  is 0 or an integer from 1 to 6, more preferably  $n$  is 0, 1, or 2, most preferably  $n$  is 0;

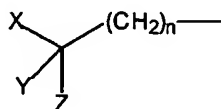
wherein  $X$  is H or halogen, more preferably halogen;  $Y$  is H or halogen, more preferably halogen; and  $Z$  is any of H; halogen;  $CF_3$ ; aliphatic group; substituted or unsubstituted aromatic or heteraromatic ring, more preferably phenyl ring; substituted or unsubstituted aromatic carbonyl or heteraromatic carbonyl, more preferably substituted or unsubstituted benzoyl.

In all cases  $R = H$ , a pharmaceutically acceptable cation, or an aliphatic substituent, more preferably methyl or ethyl.

In another aspect, the compounds have the structure:



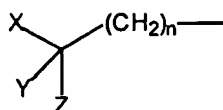
wherein  $A$  is a substituted or unsubstituted phenyl ring or a substituent having the structure:



wherein  $n$  is 0 or an integer from 1 to 6, and more preferably 0, 1 or 2, and most preferably 0; wherein  $X$  is H or halogen, and more preferably

halogen; wherein Y is H or halogen, and more preferably halogen; wherein Z is H; halogen; CF<sub>3</sub>; aliphatic group; substituted or unsubstituted aromatic or heteraromatic ring, and more preferably phenyl ring; substituted or unsubstituted aromatic carbonyl or heteraromatic carbonyl, more preferably substituted or unsubstituted benzoyl.

B is a substituted or unsubstituted phenyl ring or a substituent having the structure:



10

wherein n is 0 or an integer from 1 to 6, and more preferably 0, 1 or 2, and most preferably 0; wherein X is H or halogen, and more preferably halogen; wherein Y is H or halogen, and more preferably halogen; wherein Z is H; halogen; CF<sub>3</sub>; aliphatic group; substituted or unsubstituted aromatic or heteraromatic ring, and more preferably phenyl ring; substituted or unsubstituted aromatic carbonyl or heteraromatic carbonyl, more preferably substituted or unsubstituted benzoyl.

In all cases R is H, a pharmaceutically acceptable cation, or an aliphatic substituent, more preferably methyl or ethyl.

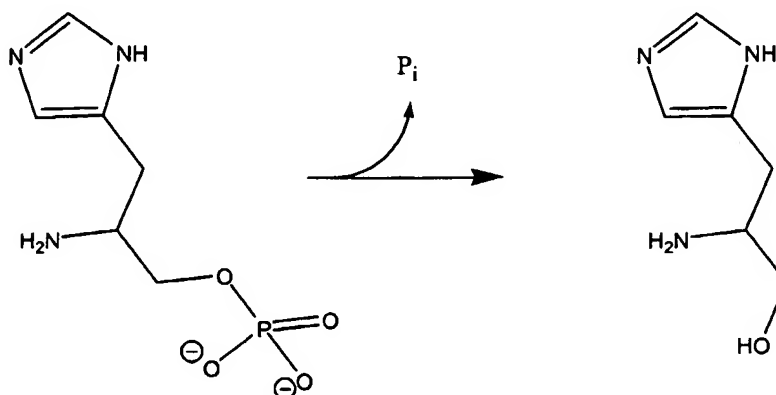
Biological activity similar to iECTA compounds for AcLS and KARI has not been ascribed to any known drugs. However, the literature has provided a synthetic protocol for a possible candidate-compound. (Wakselman and Tordeuz (1982)). This paper describes synthesis of 3,3,3-trifluoropropionic and 4,4,4-trifluoro-2-ketobutyric acids. This synthetic protocol does not describe the synthesis of all compounds of the class identified above, but is easily adapted by those of skill in the art for this purpose.



### EC 3.1.3.15 Histidinol Phosphatase

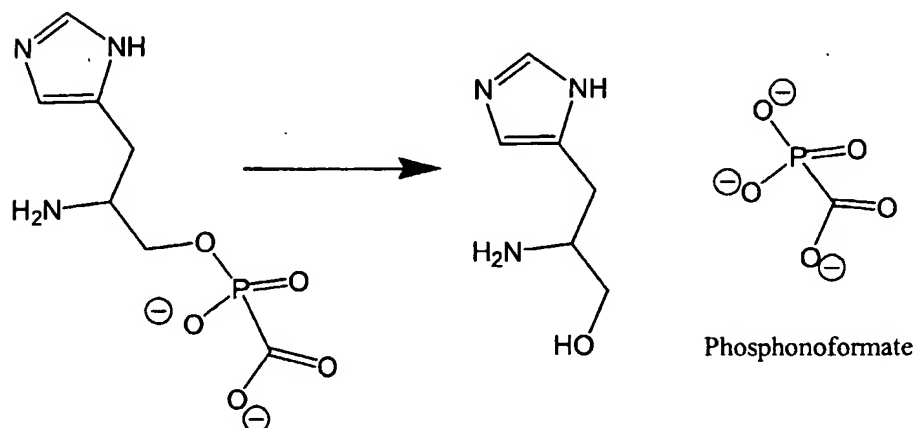
Histidinol phosphatase is found on the histidine biosynthetic pathway

- 5 and is found in bacteria and yeast, but not in mammals. Mechanism is simply water hydrolysis of a phosphate group.



10

### Histidinol Phosphatase iECTA Substrate



15

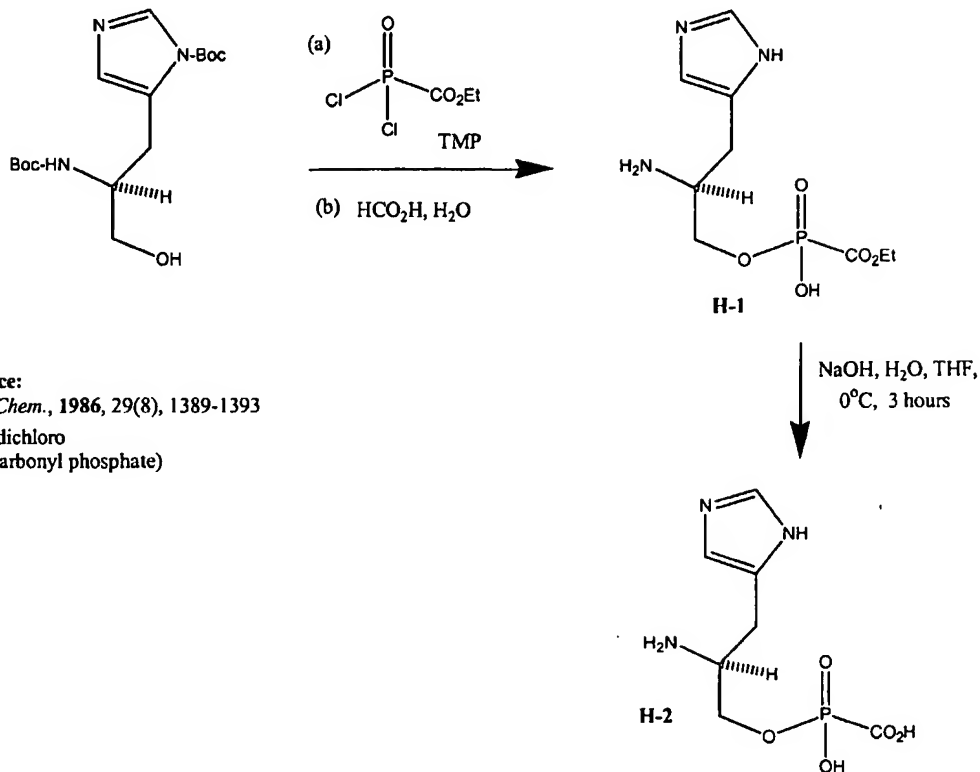
A toxophore can be substituted for the phosphate group in the substrate to create an ECTA substrate. In the example above, the DNA polymerase inhibitor phosphonoformate is used as an example of a

20 toxophore.

## Synthesis of Histidinol Phosphatase iECTA Substrate

### Histidinol phosphatase iECTA

5



### Compound H-1

- 10 To 1 gram (5.2 mmol) of ethoxycarbonyl phosphonic dichloride (J. Med Chem., 1986, 29(8), 1389-1393) dissolved in 10 mL of trimethylphosphate, and cooled to 0°C, is added 1 gram (2.9 mmol) of dry bis-N-tBoc-histidinol. The reaction is allowed to stir for 1 hour at 0°C, and then it is poured slowly into 25 mL of anhydrous diethyl ether with stirring.
- 15 The product is separated by decantation and washed twice with 5 mL anhydrous diethyl ether. The crude product is dried under vacuum and dissolved in 5 mL of anhydrous formic acid at 0°C, allowed to warm up to room temperature and stirred for 2 hours, then heated gently at 50°C for 30 minutes. Most of the formic acid is evaporated *in vacuo* at 30°C, then water

is added, and the product evaporated to dryness under reduced pressure. The product is purified on a Dowex 2 (X8, 200-400 mesh, Cl<sup>-</sup> form) column by elution with water and elution with a gradient of 0.0-0.15 M LiCl. The water is evaporated and ethanol is added. The lithium salt of product H-1 is

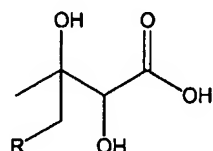
5 isolated after partial evaporation of the ethanol.

### Compound H-2

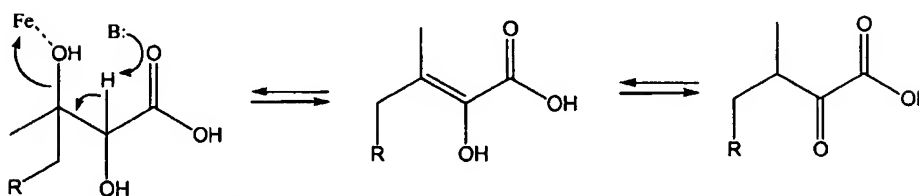
Compound H-1 is treated with 1.5eq. of NaOH in aqueous THF at 0° C for 3 hours. After evaporation of the solvent under reduced pressure, the product is purified as above to furnish the lithium salt of Compound H-2.

10

### EC 4.2.1.9 Dihydroxyacid Dehydratase



R = H (ultimate product is Valine)  
R = CH<sub>3</sub> (ultimate product is Isoleucine)



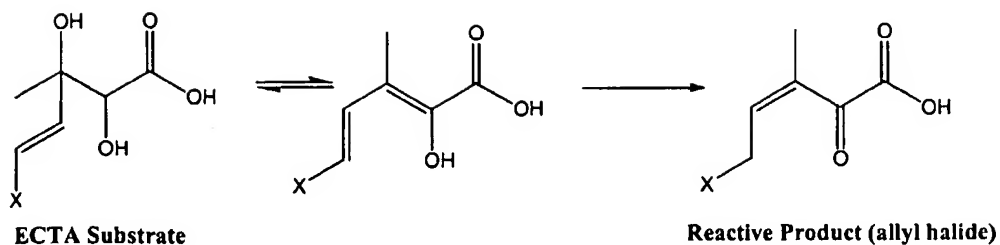
Requirement for C2 (R) configuration  
not stereoselective for C3 position

15 Dihydroxyacid dehydratase (DHAD) is an enzyme found on the branched chain amino acid biosynthetic pathway. The enzyme mechanism and substrate SAR has been well characterized by substitutions at C3 (See Pirrung et al. and Armstrong et al.).

Also, DHAD has been shown to be the target for the bacteriostatic  
20 effects of 4,7-dicyanobenzofurazan (See Takabatake et al.)

The DHAD ECTA substrate shown below is designed to generate a very reactive alkylating agent upon activation by the enzyme.

### DHAD iECTA Substrate

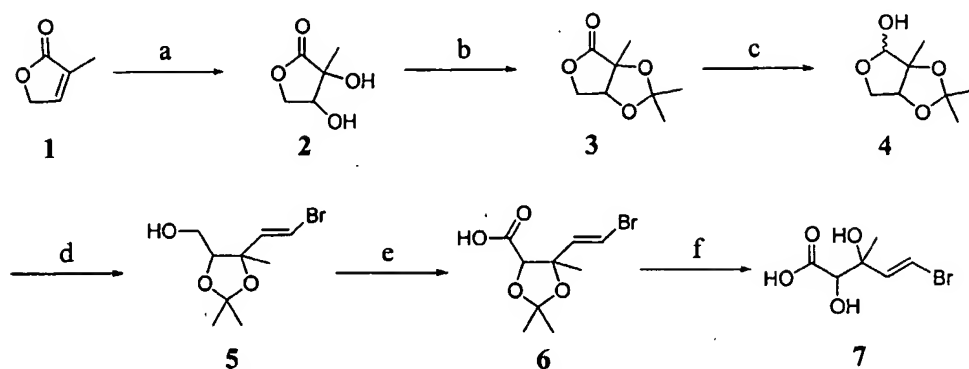


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X = Halogen

### Synthesis of DHAD iECTA Substrate

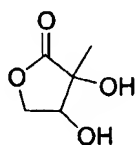
Scheme 1



10

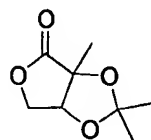
a)  $\text{OsO}_4$ , NMO, *tert*-butanol :  $\text{H}_2\text{O}$  : THF 10 : 1 : 3; b) 2,2-dimethoxypropane, TsOH, DMF; c) DIBALH,  $\text{CH}_2\text{Cl}_2$ ,  $-78^\circ\text{C}$  to rt; d)  $\text{BrPPh}_3\text{CH}_2\text{Br}$ ,  $\text{KO}^t\text{Bu}$ , THF,  $-78^\circ\text{C}$ ; e)  $\text{NaIO}_4$ ,  $\text{RuCl}_3 \cdot \text{H}_2\text{O}$ ,  $\text{H}_2\text{O}$ ,  $\text{CH}_3\text{CN}$ ,  $\text{CCl}_4$ ; f) 80 % AcOH,  $100^\circ\text{C}$ .

15



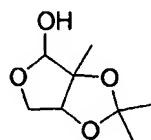
### Dihydro-3, 4-dihydroxy-3-methyl-2 (3H)-furanone (2)

To a mixture of *N*-methylmorpholine-*N*-oxide (36 mmol), *tert*-butanol (400 mL), H<sub>2</sub>O (40 mL), THF (120 mL), and OsO<sub>4</sub> (0.39 mmol) is added 3-methyl-2(5H)-furanone (1) (34 mmol). The reaction is stirred overnight. A slurry of 6 g of sodium hydrosulfite, 8 g of Florisil® and 27 mL of water is added to the reaction mixture. The mixture is stirred and filtered. The filtrate is neutralized to pH 7 with 1 N H<sub>2</sub>SO<sub>4</sub>. The THF is evaporated *in vacuo* and the remaining mixture is acidified to pH 2 with 1 N H<sub>2</sub>SO<sub>4</sub>. The solution is extracted with 3 × 150 mL of ethyl acetate. The organic layers are combined, dried over Na<sub>2</sub>SO<sub>4</sub>, and filtered. The solvent is evaporated *in vacuo*. (See VanRheenen, et al.)



**2-Methyl-2, 3-*O*-isopropylidene-erythronolactone (3)**

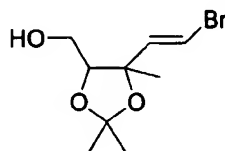
2, 2-Dimethoxypropane (84.7 mmol) and *p*-toluenesulfonic acid monohydrate (catalytic) is added to a solution of **2** (84.7 mmol) and dimethylformamide (21.2 mL). The reaction mixture is stirred overnight. The reaction is quenched with 30 mL of H<sub>2</sub>O. The water layer is extracted with 3 × 50 mL of ethyl acetate. The combined organic layers are washed with 2 × 30 mL of water and with 5 × 30 mL of brine or until the organic layer is clear. The organic layer is dried over Na<sub>2</sub>SO<sub>4</sub> and filtered. The solvent is evaporated *in vacuo*. (See Evans et al. and Lipshutz et al.)



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**2-Methyl-2, 3-*O*-isopropylidene erythrose (4)**

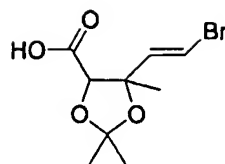
All glassware is flame dried and the reaction is performed under argon gas. A flask is charged with **3** (10.0 mmol) and CH<sub>2</sub>Cl<sub>2</sub> (31.3 mL) and cooled to -78 °C in an acetone-dry ice bath. A 1.0 M solution of DIBALH in THF (15.6 mmol) is added dropwise down the sides of the flask. The  
5 reaction mixture is stirred at -78 °C for 3 hours. The reaction mixture is warmed to room temperature overnight. The reaction mixture is cooled to 0 °C in an ice bath and 5 mL of methanol is added to quench the reaction mixture. To a mixture of 1 : 1 water : ethyl acetate (150 mL each) is added to the reaction mixture. The aqueous layer is acidified to pH 3 with 5 %  
10 H<sub>2</sub>SO<sub>4</sub>. The phases are separated and the aqueous layer is extracted with 2 × 75 mL ethyl acetate. The combined organic layers are dried over Na<sub>2</sub>SO<sub>4</sub>, filtered, and the solvent is evaporated *in vacuo*. (See Gypser et al. and Cohen et al.)



15

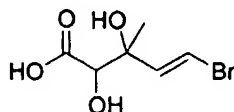
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All glassware is flame dried and the reaction is performed under argon gas. A flask charged with (bromomethyl)triphenylphosphonium bromide (12.6 mmol) and THF (22 mL) is cooled to -78° C in an acetone-dry ice bath  
20 and a 1 M solution of potassium *tert*-butoxide in THF (12.6 mmol) is added dropwise. A solution of **4** (4.2 mmol) in THF (2.2 mL) is added dropwise. The reaction mixture is stirred for 1 hour at -78 °C. The cooling bath is removed and the reaction mixture is left overnight. The reaction mixture is quenched with 50 mL of water. The water layer is extracted with 3 × 50 mL  
25 of diethyl ether. The organic layers are combined and washed with 1 × 100 of brine. The organic layer is dried over MgSO<sub>4</sub>, filtered, and the solvent is evaporated *in vacuo*. (See Gypser, et al. and Dötz, et al. )



6

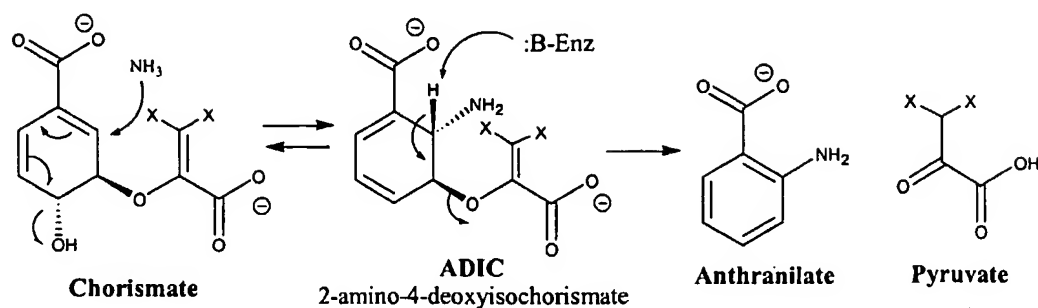
To a flask charged with water (3 mL), CCl<sub>4</sub> (2 mL), and acetonitrile (2 mL), is added NaIO<sub>4</sub> (4.7 mmol), ruthenium(III) chloride hydrate (2.2 mol percent), and **5** (1.1 mmol). The reaction mixture is stirred at room temperature for 1 hour. Diethyl ether (20 mL) is added to the reaction mixture which is then stirred for 10 minutes. The solution is filtered and the solids are washed with diethyl ether. The solvent is evaporated *in vacuo*.  
 (See *J. Org. Chem.*)



15

7

Isopropylidene **6** (1.0 mmol) is dissolved in 80 % acetic acid (5 mL) and heated at 100° C for 1.5 hours. The reaction mixture is cooled and the solvent is evaporated *in vacuo*. (See Lewbart, et al. and Hanessian, et al.)

**EC 4.1.3.27 Anthranilate Synthase**

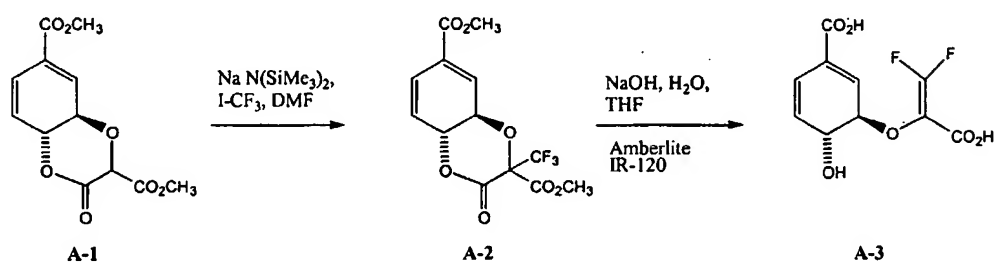
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X = Hydrogen = natural substrate

X = Halogen = ECTA substrate

Chorismate is the branch point for the biosynthesis of several natural products. The reaction shown above is the first step down the tryptophan biosynthetic pathway where chorismate is converted to anthranilate and pyruvate. By substituting halogens for one or both hydrogens as shown above, a very potent alkylating agent can be produced, di- or mono-halo-pyruvate. This can be the basis for several other ECTA substrates. The synthesis of a chorismate based ECTA substrate is shown below:

15



20

**Synthesis of Anthranilate Synthase ECTA Substrate****Compound A-1**

Hexamethyldisilazane (0.350 g, 2.16 mmol) is added to a suspension of oil free NaH (0.048 g, 2.00 mmol) (pre-washed with petroleum ether) in 5



mL of anhydrous DMF. When H<sub>2</sub> evolution ceases, a solution of lactone A-1 (See Ganem et al.) (0.536 g, 2.00 mmol) in 5 mL DMF is added. After stirring 15 minutes at room temperature, a solution of trifluoromethyl iodide (0.800 g, 4.10 mmol) in 5 mL DMF is added, and the reaction is allowed to proceed at room temperature for 3 hours. The reaction is then poured into saturated NaCl solution and extracted with ethyl acetate (2 x 25 mL). The combined organic layers are washed with saturated NaCl (2 x 25 mL), dried over anhydrous Na<sub>2</sub>SO<sub>4</sub>, and the solvent evaporated under reduced pressure to furnish crude A-2, which is processed as is in the next step.

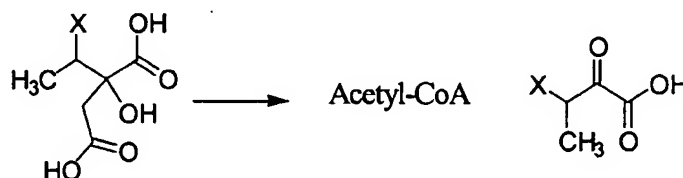
10

### Compound A-3

The crude product from the alkylation step is dissolved in 10 mL of ice-cold THF and 2.0 equivalents of aqueous 0.01 M NaOH are added. The reaction is allowed to proceed at 0° C for 3 hours. After 3 hours, the reaction is stirred gently with Amberlite IR-120 resin (See Berchtold, et al.), filtered, and the solvent evaporated under reduced pressure. Compound A-3 is purified by recrystallization from ethyl acetate-hexane.

20

### EC 4.1.3.12 Isopropylmalate Synthase



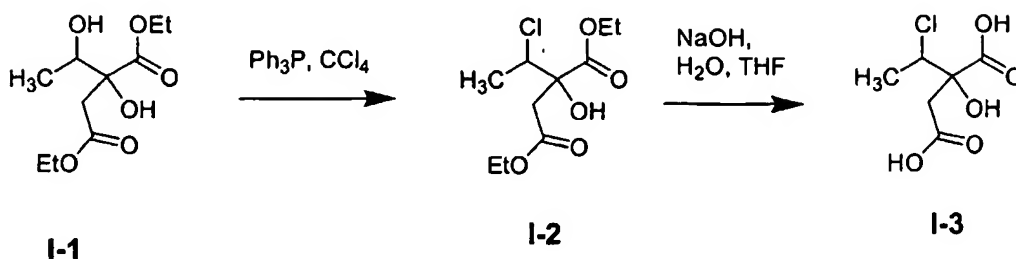
X = CH<sub>3</sub> = natural substrate

X = Halogen = ECTA substrate

25

The reaction shown above is on the branched chain amino acid (BCAA) biosynthetic pathway. By substituting a halogen for one of the methyl groups as shown above, a very potent alkylating agent can be produced, 3-halo-2-oxobutanoate.

### Synthesis of 2-Isopropylmalate Synthase iECTA

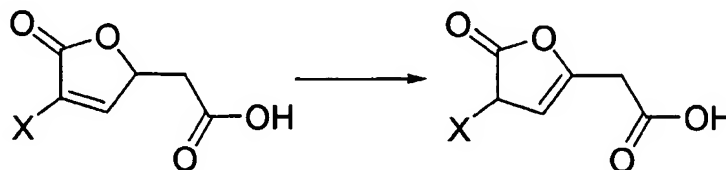


5

To a mixture of 1 gram of dihydroxy diester I-1 (*See* Zhdanov et al.) and 2.5 grams of anhydrous triphenyl phosphine is added 20 mL of anhydrous CCl<sub>4</sub>, and the reaction is refluxed for 15-30 minutes (*See* *Tetrahedron*). The solvent is then evaporated to dryness under reduced pressure. The residue is extracted twice with 25 mL of diethyl ether, and the combined fractions are evaporated under reduced pressure. The resulting crude chloroester I-2 is hydrolyzed to the corresponding dicarboxylic acid by stirring with 2.0 equivalents of aqueous NaOH in THF at 0° C for 3.5 hours. The reaction is then acidified with dilute HCl, and the product is obtained by extraction with two 25 mL portions of ethyl acetate. The ethyl acetate fractions are combined, dried with anhydrous Na<sub>2</sub>SO<sub>4</sub>, filtered and the solvent is removed under reduced pressure. The product I-3 is purified by chromatography on silica gel using EtOAc/Hexane/HOAc.

20

#### EC 5.3.3.4 Muconolactone Δ-Isomerase



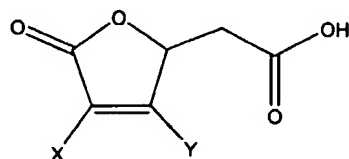
25

X = Hydrogen = natural substrate

X = Halogen = ECTA substrate

The reaction shown above is on the phenylalanine metabolism pathway. The enzyme converts a stable vinyl-halo ester into a very reactive (alkylator) allyl halide species.

5 **Muconolactone  $\Delta$ -Isomerase ECTA Substrate:**



**KNOWN COMPOUNDS**

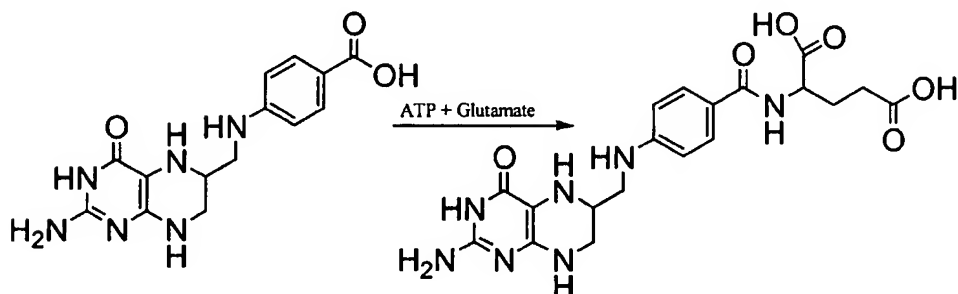
X = Cl, F; Y = H

X = Br, Cl; Y = OH, CH<sub>3</sub>

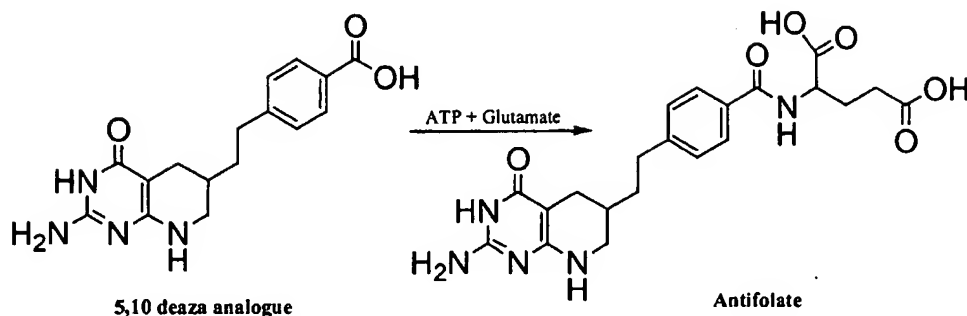
See McKague, Vollmer, et al., Freer, et al., Patrick et al., Bloomer, et al., and Syendsen, et al..

10

**EC 6.3.2.12 Dihydrofolate Synthase**



15 The reaction shown above is the final step in folic acid biosynthesis where a glutamate is conjugated to the dihydropteroylserine substrate. Most microorganisms produce their own folic acid, whereas it is an essential vitamin for humans because we lack this biosynthetic pathway right up through this step. Antifolates have been used for both cancer chemotherapy  
20 as well as for microbial infections, but they are only potent after glutamate conjugation (*See Goodman and Gillman (1996) THE PHARMACOLOGICAL BASIS OF THERAPEUTICS, 9<sup>th</sup> edition, McGraw-Hill*). We can take advantage of the above reaction for ECTA by delivering a pteroyl acid analogue of an antifolate and allowing the microbial dihydrofolate synthase to attach the first  
25 glutamate. The pteroyl acid itself should not be toxic to the host.

**iECTA Substrate for Dihydrofolate Synthase:**

5

The 5,10-dideazapteroic acid is a known compound, and its synthesis has been published. The 5,10-dideazafolate is an experimental antifolate (*Id.*) (*See also* Degraw et al. and Taylor et al.).

10

**Experiment # 6- Biological Confirmation for Selecting a Candidate AcLS or KARI iECTA Prodrug**

*Salmonella typhimurium*, *Escherichia coli* or other bacteria or fungi are used as test cells. Two phenotypes are employed. One strain is normal for acetolactate synthase (AcLS) and the other is deficient. Such strains have been previously described, *e.g.*, Shaw, et al. (1980) and Weinstock, et al. (1992) and can be obtained from the American Type Culture Collection, the *E. coli* Genetic Stock Center (Yale University), the Salmonella Genetic Stock Center (University of Calgary, Canada), and other sources. The AcLS-negative strains are generally referred to as *ilv*<sup>-</sup> because they are dependent upon added isoleucine and valine for growth. The *ilv*<sup>-</sup> mutant strains will be compared to the normal parent strains (*ilv*<sup>+</sup>) for sensitivity to candidate compounds. Strains that express the active form of AcLS will be able to transform an AcLS iECTA compound into a cytotoxic moiety. For this reason, the normal strains will be more sensitive to a successful AcLS compound than will the mutant *ilv*<sup>-</sup> strains. Similar assays can also be

25

performed on mammalian cells to determine the degree of specificity for AcLS-producing bacteria or fungi.

Assays are performed on agar plates or in liquid media containing the appropriate nutrients (Miller (1972)). Inhibition of growth of  $ilv^+$  strains is measured by decreased colony formation on agar plates containing a potential AcLS activated prodrug, or decreased growth rate in liquid culture containing the candidate drug (Minimal Inhibitory Concentration, MIC.) Utility is further demonstrated by performing these assays comparing the candidate AcLS iECTA compounds with known antibiotics versus pathogens. Similar growth assays can be performed to test the utility of potential compounds on yeast and other potential pathogens using methods appropriate for these eukaryotic organisms, as described by Spector, et al. (1998). Additional tests are performed to demonstrate minimal toxicity vs. normal animal or human cells. These tests are done as described by Sugarman, et al. (1986). A satisfactory result will be at least 10-fold, and preferably one hundred or one thousand fold greater sensitivity of pathogen (such as bacteria or yeast) to AcLS iECTA compounds as compared to animal or human cells.

#### **Experiment # 7 - Prodrugs Designed To Target iECTA Enzymes**

Using the methods described above, the following iECTA prodrugs and enzyme prodrug systems are provided.

When the enzyme is a member of the subgroup 1.1, the compound has the structure: R-CHOH-X-Toxin, wherein X is selected from the group consisting of O, S, and NH.

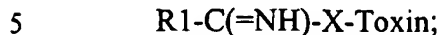
When the enzyme is a member of the subgroup EC 1.2, the prodrug is a compound of the structure: R-(C=O)-X-Toxin, wherein X is O or S.

When the enzyme is a member of the subgroup EC 1.3, the prodrug is a compound of the structure: R<sub>1</sub>R<sub>2</sub>-CH-CHR<sub>3</sub>-CH<sub>2</sub>-X-Toxin, wherein R<sub>1</sub>, R<sub>2</sub> and R<sub>3</sub> are unspecified, and wherein X is O or S.

When the the enzyme is a member of the subgroup EC 1.4 or 1.5, then the prodrug is a compound of the structure:

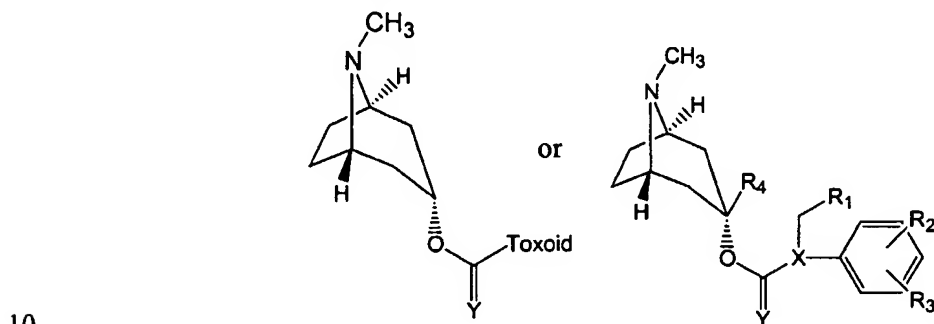


or



wherein X is selected from the group O, S and NH, with the proviso that when X is S or O, the amine (NH) is not an amide.

When the enzyme is a member of the subgroup EC 3.1.1.10, the prodrug is a compound having either structure:



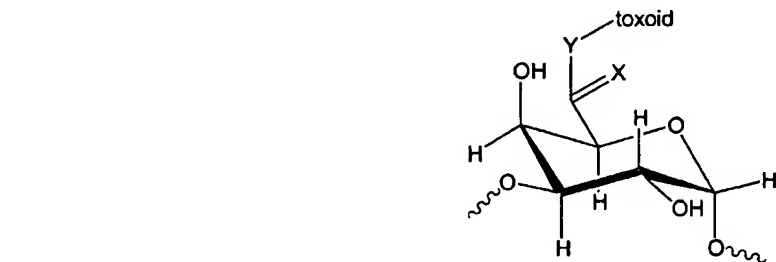
wherein Y is selected from the group consisting of O, S, Se, and NR;

wherein R is unspecified;

wherein X is selected from the group consisting of C and N; and

wherein each of R1, R2, R3 and R4 is independently the same or different and is a toxoid, or is unspecified. The “toxoid” is directly linked  
15 toxoid or connected through a linker (i.e., self-immolative).

When the enzyme is a member of the subgroup EC 3.1.1.11, the prodrug is a compound of the structure:

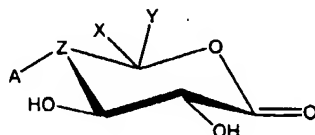


wherein X is selected from the group consisting of O, S, Se, and NR;

wherein R is unspecified; and

wherein Y is selected from the group consisting of O, S and NR,  
 wherein R is unspecified. Toxoid is either toxoid or linker-toxoid.

When the enzyme is a member of the subgroup EC 3.1.1.17, the  
 prodrug is a compound of the structure:

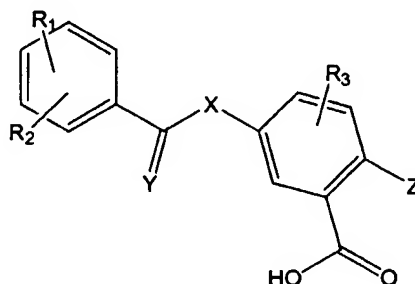


wherein A, X, and Y are independently the same or different and is  
 selected from the group consisting of a toxoid,  $\text{CH}_2\text{OH}$  or  $\text{CH}_2\text{OPO}_3$ ;

wherein Z is selected from the group consisting of  $\text{CH}_2$ , N, NR, O, S  
 and Se; and

wherein R is unspecified.

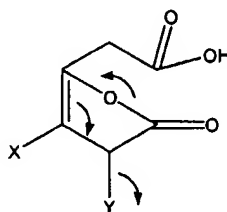
When the enzyme is a member of the subgroup EC 3.1.1.20, the  
 prodrug is a compound of the structure:



wherein R1, R2, R3 are independently the same or different and are  
 unspecified; and

wherein Z is a linker and/or a toxoid.

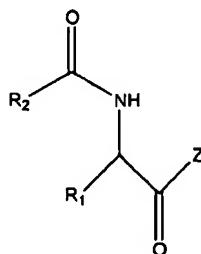
When the enzyme is a member of the subgroup EC 3.1.1.24, the  
 prodrug is a compound of the structure:



wherein X is a halide or hydrogen; and

wherein Y is a linker-toxoid or a toxoid.

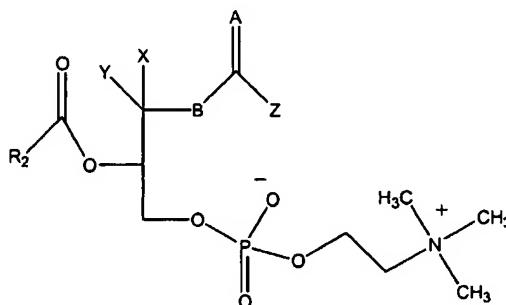
When the enzyme is a member of the subgroup EC 3.1.1.29, the prodrug is a compound of the structure:



wherein each of R1 and R2 are independently the same or different  
5 and is selected from the group consisting of an amino acid, an amino acid side chain, a toxoid, a linker, or a peptide; and

wherein Z is selected from the group consisting of a toxoid which may have RNA like structure or be RNA or a nucleic acid analog.

When the enzyme is a member of the subgroup EC 3.1.1.32, the  
10 prodrug is a compound of the structure:



wherein R2 is a fatty acid;

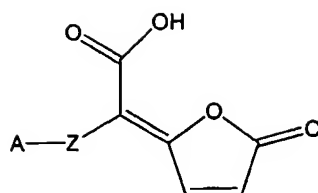
wherein X, Y and Z are independently the same or different and is selected from the group consisting of a toxoid, toxoid linker, O, S, and NR,

15 wherein R is unspecified; and

wherein A and B are independently the same or different and is selected from the group consisting of O, S, and NR wherein R is unspecified.

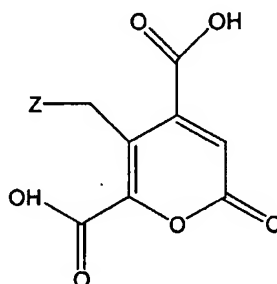
When the enzyme is a member of the subgroup 3.1.1.45, the prodrug is a compound of the structure:





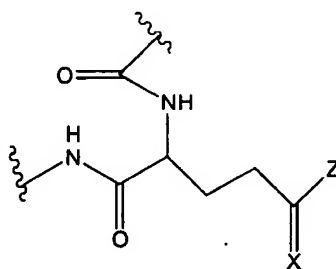
wherein A and Z are independently the same or different and is selected from the group consisting of toxoid, toxoid-linker, a halogen and a heteroatom.

- 5           When the enzyme is a member of the subgroup 3.1.1.57, the prodrug is a compound of the structure:



wherein Z is selected from the group consisting of toxoid and toxoid-linker.

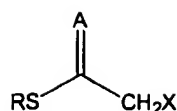
- 10           When the enzyme is a member of the subgroup 3.1.1.61, the prodrug is a compound of the structure:



wherein Z is selected from the group consisting of toxoid and toxoid-linker; and

- 15           wherein X is selected from the group consisting of O, S, and NR, wherein R is unspecified.

When the enzyme is a member of the subgroup 3.1.2.1, the prodrug is a compound of the structure:



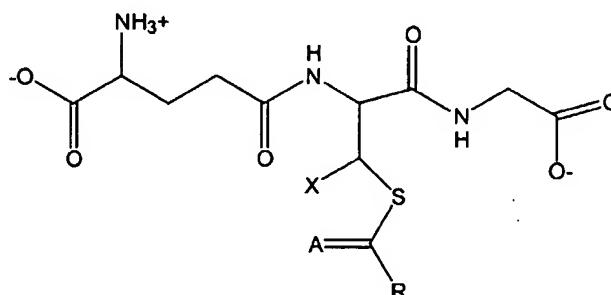
wherein RS is Coenzyme A ("CoAS") or a variable thiol including smaller analogs of CoAS;

wherein A is selected from the group consisting of O, S, and NR,

5 wherein R is unspecified; and

wherein X is Cl, Br, I and F.

When the enzyme is a member of the subgroup 3.1.2.12, the prodrug is a compound of the structure:



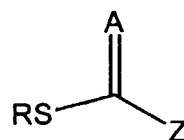
10 wherein X is H or a toxoid;

wherein A is selected from the group consisting of O, S, and NR; and

wherein R is selected from the group consisting of H, a halomethyl and a toxoid.

When the enzyme is a member of the subgroup 3.1.2.14, the prodrug

15 is a compound of the structure:

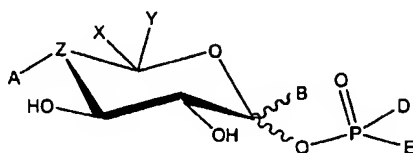


wherein R is selected from the group consisting a simple or complex thiol and ACP or acyl carrier protein;

wherein A is O, S, and NR, wherein R is unspecified; and

20 wherein Z is selected from the group consisting of a toxoid, a toxoid-linker, and a fatty acid analog having antibacterial/antifungal/antimicrobial properties.

When the enzyme is a member of the subgroup 3.1.3.10, the prodrug is a compound of the structure:

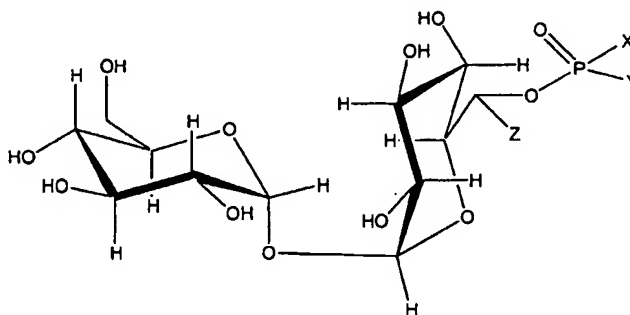


wherein A, B, X and Y are independently the same or different and  
 5 each is selected from the group consisting of toxoid, CH<sub>2</sub>OH, CH<sub>2</sub>OPO<sub>3</sub> and H;

wherein Z is selected from the group consisting of CH<sub>2</sub>, N, O, S, SE or NR, wherein R is unspecified; and

wherein D and E are independently the same or different and is  
 10 selected from the group consisting of OH, NHCH<sub>2</sub>CH<sub>2</sub>Cl and SCH<sub>2</sub>CH<sub>2</sub>Cl.

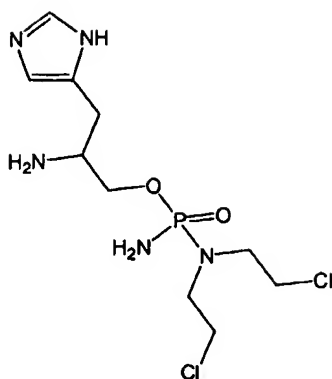
When the enzyme is a member of the subgroup 3.1.3.12, the prodrug is a compound of the structure:



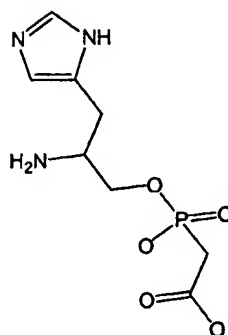
wherein Z is selected from the group consisting of a toxoid, H and a  
 15 toxoid-linker; and

wherein X and Y are independently the same or different and is selected from the group consisting of OH, NHCH<sub>2</sub>CH<sub>2</sub>Cl and SCH<sub>2</sub>CH<sub>2</sub>Cl.

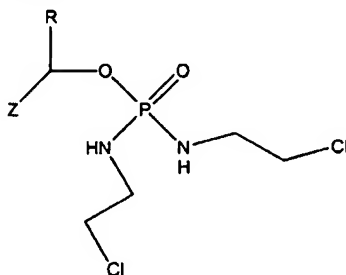
When the enzyme is a member of the subgroup 3.1.3.15, the prodrug is a compound of the structure:



or

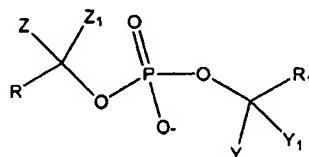


When the enzyme is a member of the subgroup 3.1.3.X, wherein X is  
 5 18 or 27, the prodrug is a compound of the structure:



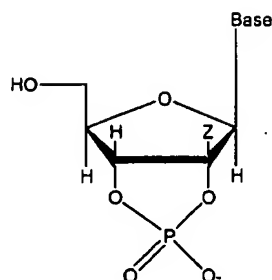
wherein Z is selected from the group consisting of H, a toxoid and  
 toxoid-linker.

When the enzyme is a member of the subgroup 3.1.4.14, the prodrug  
 10 is a compound of the structure:



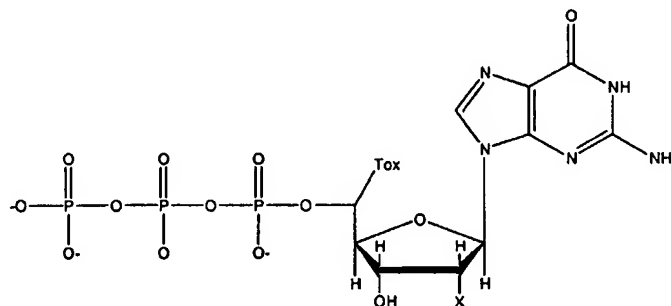
wherein Y, Y1, Z and Z1 is a toxoid.

When the enzyme is of the subgroup 3.1.4.16, the prodrug is a compound having the structure:



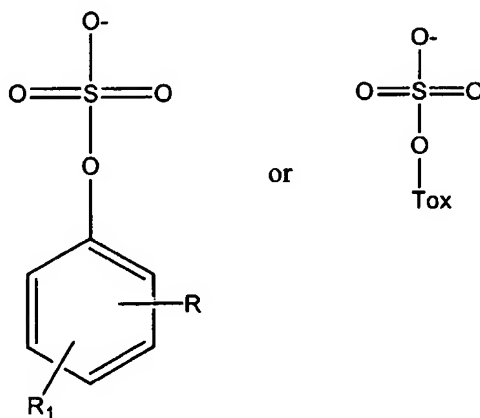
wherein the base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil; and  
 5 wherein Z is a toxoid.

When the enzyme is of the subgroup 3.1.5.1, the prodrug is a compound having the structure:



10 wherein X is H or OH; and  
 wherein Tox is a toxoid.

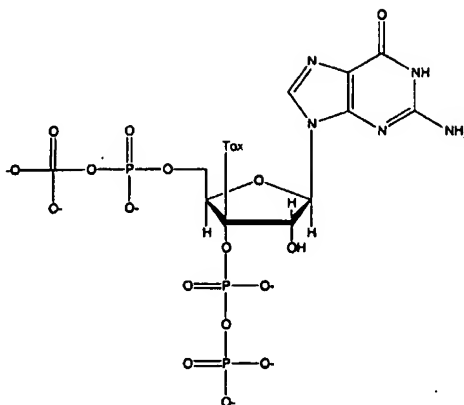
When the enzyme is of the subgroup 3.1.6.1, the prodrug is a compound having the structure:



15 wherein R and R1 is a toxoid or linker-toxoid; and

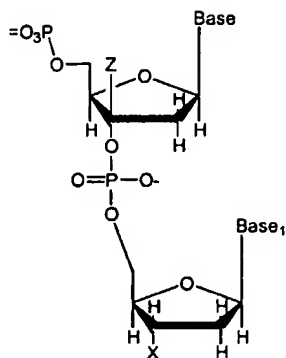
wherein Tox is a toxoid.

When the enzyme is of the subgroup 3.1.7.2, the prodrug is a compound having the structure:



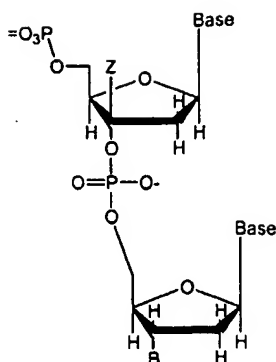
5 wherein Tox is a toxoid.

When the enzyme is of the subgroup 3.1.11.1, the prodrug is a compound having the structure:



wherein the base is selected from the group consisting of adenine,  
 10 tyrosine, guanine, cytosine and uracil;  
 wherein Base 1 is a toxoid;  
 wherein Z is selected from the group consisting of toxoid and toxoid-linker; and  
 wherein X is OH or a phosphate.

15 When the enzyme is of the subgroup 3.1.11.5, the prodrug is a compound having the structure:

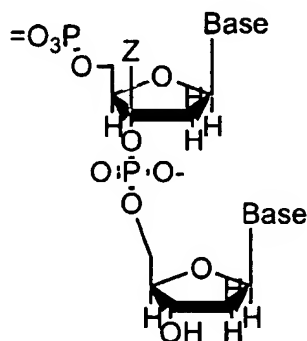


wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;

wherein B is a phosphate or a DNA small oligonucleotide; and

5 wherein Z is a toxoid or a toxoid-linker.

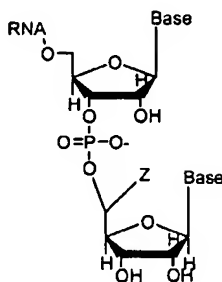
When the enzyme is of the subgroup 3.1.11.6, the prodrug is a compound having the structure:



wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil; and

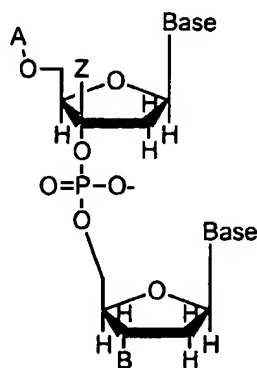
10 wherein Z is a toxoid or a toxoid-linker.

When the enzyme is of the subgroup 3.1.13.1, the prodrug is a compound having the structure:



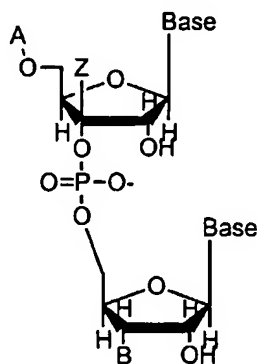
wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil; and  
 wherein Z is a toxoid or a toxoid-linker.

When the enzyme is of the subgroup 3.1.21.x, wherein x is selected  
 5 from the group consisting of 2, 3, 4, and 5, then the prodrug is a compound having the structure:



wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;  
 10 wherein A and B are independently the same or different and are selected from the group consisting of a phosphate and a deoxyribonucleic acid small oligonucleotide; and  
 wherein Z is a toxoid or a toxoid-linker.

When the enzyme is of the subgroup 3.1.26.x, wherein x is selected  
 15 from the group consisting of 3, 4, and 5, then the prodrug is a compound having the structure:



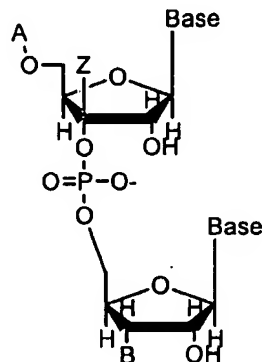
wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;



wherein A and B are independently the same or different and are selected from the group consisting of a phosphate and a deoxyribonucleic acid small oligonucleotide; and

wherein Z is a toxoid or a toxoid-linker.

- 5 When the enzyme is selected from the subgroup 3.1.26.X, wherein X is selected from the group consisting of 3, 5, and 6, the prodrug is a compound having the structure:

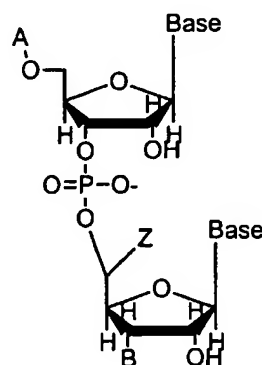


- wherein the base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;

wherein A and B are independently the same or different and is a phosphate or a ribonucleic acid small oligonucleotide; and

wherein Z is a toxoid or toxoid-linker.

- 15 When the enzyme is of the subgroup 3.1.27.6, the prodrug is a compound having the structure:

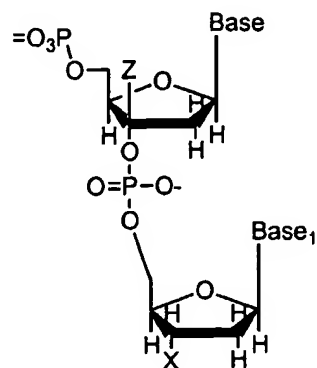


wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;

wherein A and B are independently the same or different and are selected from the group consisting of a phosphate and a ribonucleic acid oligonucleotide; and

wherein Z is a toxoid or a toxoid-linker.

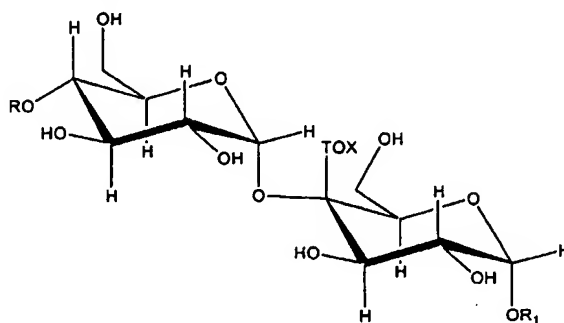
- 5 When the enzyme is of the subgroup 3.1.31.1, the prodrug is a compound having the structure:



wherein Base is selected from the group consisting of adenine, tyrosine, guanine, cytosine and uracil;

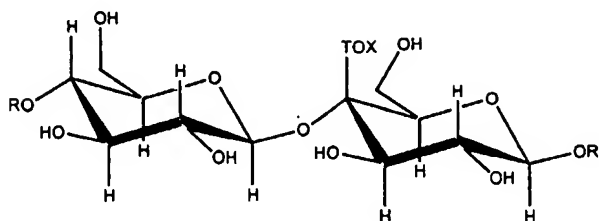
- 10 wherein Base1 is a toxoid;  
 wherein X is OH or a phosphate;  
 wherein Y is H or OH; and  
 wherein Z is a toxoid or a toxoid-linker.

- When the enzyme is of the subgroup 3.2.1.3, the prodrug is a  
 15 compound having the structure:



wherein R is H and R1 is a glucose polymer of the formula (glucose)<sub>n</sub>,  
 wherein n is an integer from 1 to \_\_\_\_; and  
 wherein TOX is a toxoid.

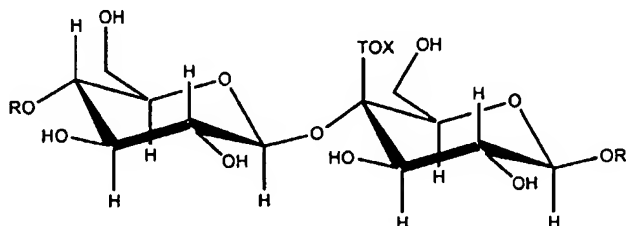
When the enzyme is of the subgroup 3.2.1.4, the prodrug is a compound having the structure:



wherein R and R1 are the same or different and is repeating beta-(1,4)-  
5 glucose in cellulose; and

wherein TOX is a toxoid.

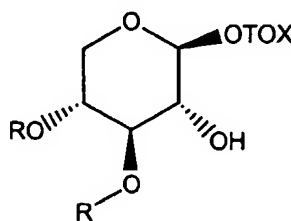
When the enzyme is of the subgroup 3.2.1.73, the prodrug is a compound having the structure:



10 wherein R and R1 are the same or different and are repeating beta-D-glucans containing 1-3 or 1-4 linkages; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.8, the prodrug is a compound having the structure:

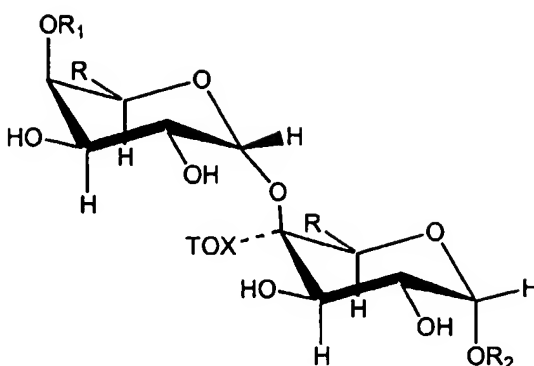


15

wherein R is H or an oligosaccharide; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.15, the prodrug is a compound having the structure:

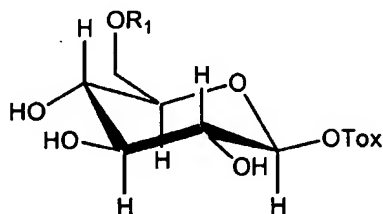


wherein R is  $\text{CO}_2\text{H}$ ;

wherein R1 and R2 is polygalacturonic acids linked alpha 1-4; and

wherein TOX is a toxoid.

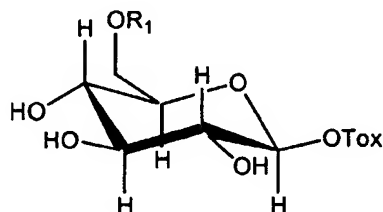
- 5        When the enzyme is of the subgroup 3.2.1.21, the prodrug is a compound having the structure:



wherein R1 is H or beta-glucosidase; and

wherein TOX is a toxoid.

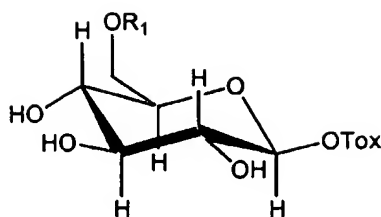
- 10       When the enzyme is of the subgroup 3.2.1.86, the prodrug is a compound having the structure:



wherein R1 is phosphate or 6-phospho-beta-glucosidase; and

wherein TOX is a toxoid.

- 15       When the enzyme is of the subgroup 3.2.1.91, the prodrug is a compound having the structure:

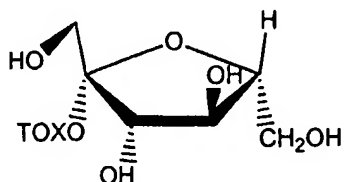


wherein R<sub>1</sub> is unspecified; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.26, the prodrug is a

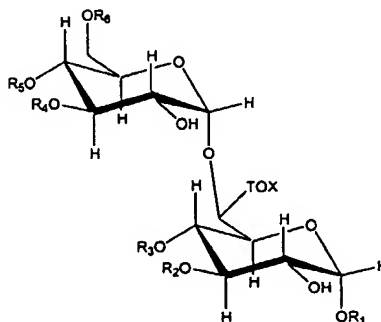
5 compound having the structure:



wherein TOX is a toxoid or a glucose derivative.

When the enzyme is of the subgroup 3.2.1.33, the prodrug is a

compound having the structure:



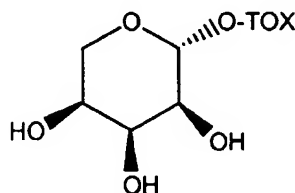
10

wherein each of R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub> and R<sub>6</sub> are independently the same or different and is selected from the group consisting of H or a saccharide; and

wherein TOX is a toxoid.

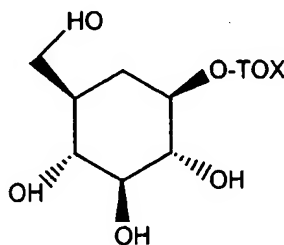
15

When the enzyme is of the subgroup 3.2.1.55, the prodrug is a compound having the structure:



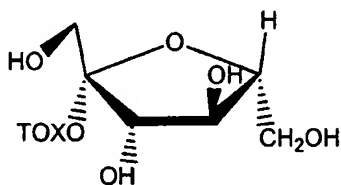
wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.58, the prodrug is a compound having the structure:



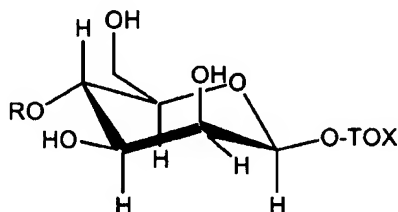
5 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.65, the prodrug is a compound having the structure:



wherein TOX is a toxoid.

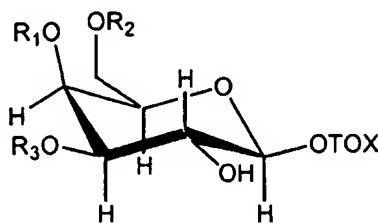
10 When the enzyme is of the subgroup 3.2.1.78, the prodrug is a compound having the structure:



wherein R is unspecified; and

wherein TOX is a toxoid.

15 When the enzyme is of the subgroup 3.2.1.85, the prodrug is a compound having the structure:



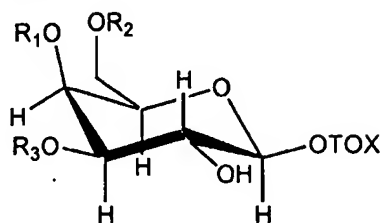
wherein R1 is H;

wherein R<sub>2</sub> is PO<sub>3</sub>;

wherein R<sub>3</sub> is H; and

wherein TOX is a toxoid.

- When the enzyme is of the subgroup 3.2.1.81, the prodrug is a  
 5 compound having the structure:

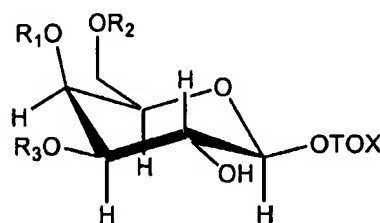


wherein R<sub>1</sub> is agarose;

wherein R<sub>2</sub> and R<sub>3</sub> are each H; and

wherein TOX is a toxoid.

- 10 When the enzyme is of the subgroup 3.2.1.83, the prodrug is a  
 compound having the structure:

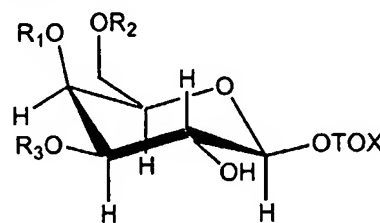


wherein R<sub>3</sub> is a carrageen polymer;

wherein R<sub>1</sub> is SO<sub>3</sub><sup>-</sup>;

- 15 wherein R<sub>2</sub> is OH; and  
 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.89, the prodrug is a  
 compound having the structure:

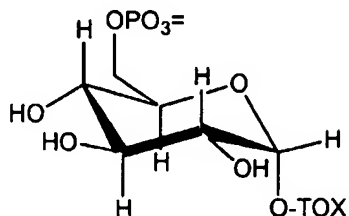


- 20 wherein R<sub>1</sub> is an arabinogalactan polymer;

wherein R2 and R3 are independently the same or different and is a H or an arabinogalactan polymer; and

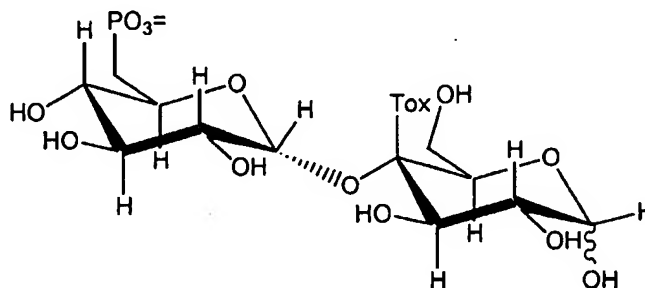
wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.1.93, the prodrug is a  
5 compound having the structure:



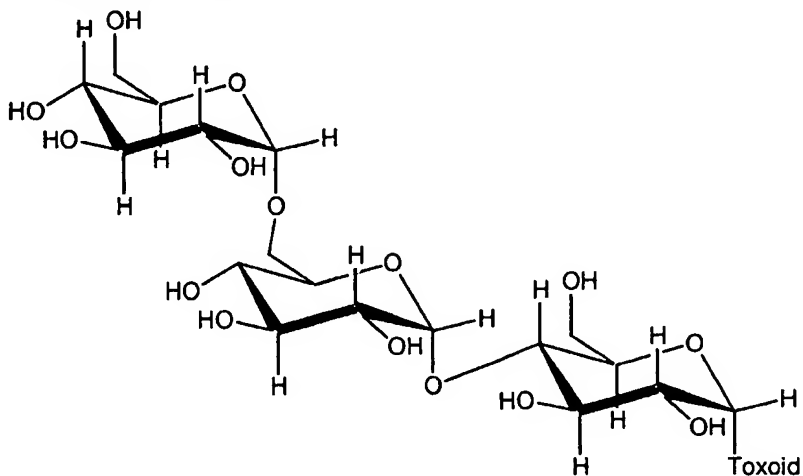
wherein TOX is a toxoid that may alternatively have a saccharide structure.

When the enzyme is of the subgroup 3.2.1.122, the prodrug is a  
10 compound having the structure:



wherein TOX is a toxoid.

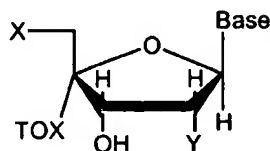
When the enzyme is of the subgroup 3.2.1.135, the prodrug is a  
compound having the structure:





wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.1, the prodrug is a compound having the structure:

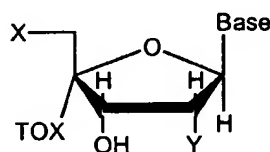


5 wherein Base is a purine;

wherein X and Y are independently the same or different and is OH or a purine nucleosidase; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.16, the prodrug is a  
10 compound having the structure:



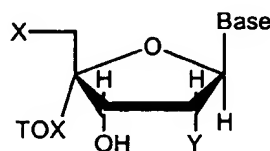
wherein Base is adenine;

wherein X is  $\text{CH}_3\text{S}$ ;

wherein Y is OH or a methylthioadenosine nucleosidase; and

15 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.20, the prodrug is a compound having the structure:



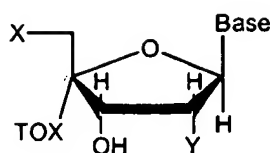
wherein Base is a 3-methylated adenine;

20 wherein X is deoxyribonucleic acid;

wherein Y is H or DNA-3-methyladenine glycosidase I; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.23, the prodrug is a compound having the structure:



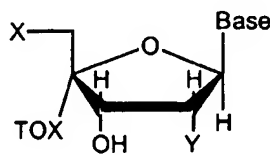
wherein Base is ring-opened N7-methylguanine;

wherein X is deoxyribonucleic acid;

wherein Y is H or formamidopyrimidine-DNA glycosidase; and

5 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.4, the prodrug is a compound having the structure:



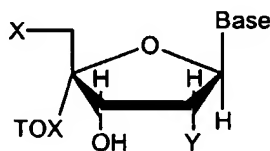
wherein Base is adenine;

10 wherein X is  $\text{OPO}^3$ ;

wherein Y is OH or AMP nucleosidase; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.2.2.9, the prodrug is a compound having the structure:



15

wherein Base is adenine;

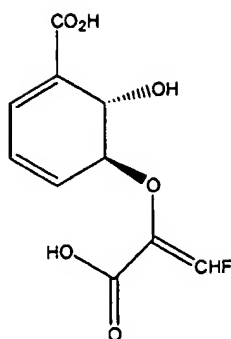
wherein X is S-homocysteine;

wherein Y is OH or S-adenosylhomocysteine nucleosidase; and

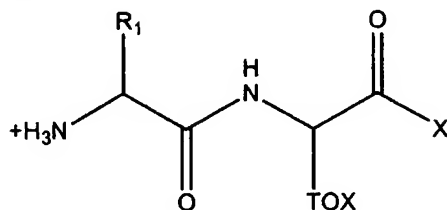
wherein TOX is a toxoid.

20

When the enzyme is of the subgroup 3.3.2.1, the prodrug is a compound having the structure:



When the enzyme is of the subgroup 3.4.11.10, the prodrug is a compound having the structure:



5

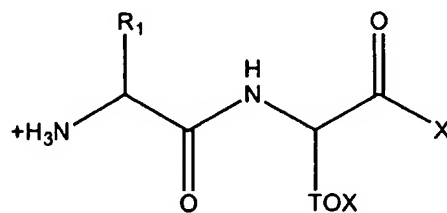
wherein R1 is a leucyl side chain;

wherein R2 is any amino acid;

wherein X is an oligopeptide or a leucyl aminopeptidase; and

wherein TOX is a toxoid.

10 When the enzyme is of the subgroup 3.4.11.5, the prodrug is a compound having the structure:



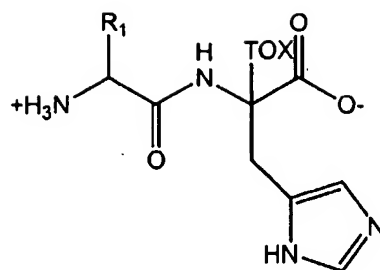
wherein R1 is a proline side chain;

wherein R<sub>2</sub> is any amino acid;

15 wherein X is an oligopeptide or a proline iminopeptidase; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.13.3, the prodrug is a compound having the structure:

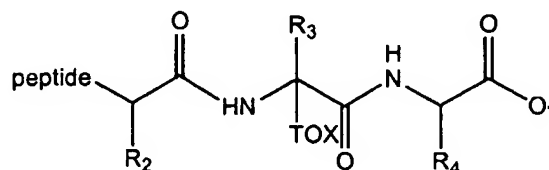


wherein R1 is unspecified; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.15.5, the prodrug is a

5 compound having the structure:

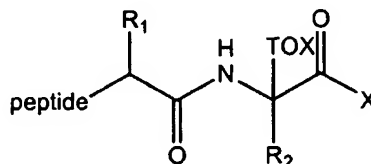


wherein R2, R3 and R4 are unspecified; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.16.4, the prodrug is a

10 compound having the structure:

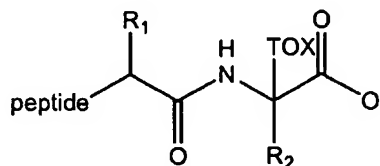


wherein R1 and R2 is a D-Ala amino acid side chain; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.17.11, the prodrug is a

15 compound having the structure:



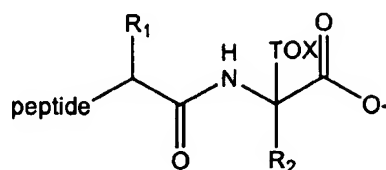
wherein R1 is unspecified;

wherein R2 is a glutamate side chain or glutamate carboxypeptidase;

and

20 wherein TOX is a toxoid.

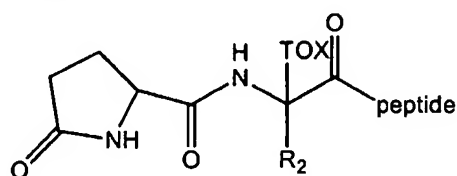
When the enzyme is of the subgroup 3.4.17.19, the prodrug is a compound having the structure:



wherein R1 and R2 are unspecified; and

5 wherein TOX is a toxoid.

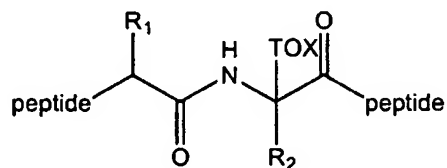
When the enzyme is of the subgroup 3.4.19.3, the prodrug is a compound having the structure:



wherein R2 is unspecified; and

10 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.21.50, the prodrug is a compound having the structure:

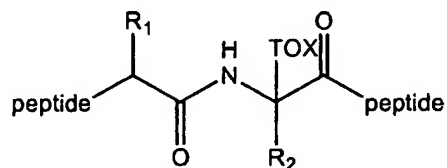


wherein R1 is a lysyl side chain;

15 wherein R2 is unspecified, and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.21.53, the prodrug is a compound having the structure:

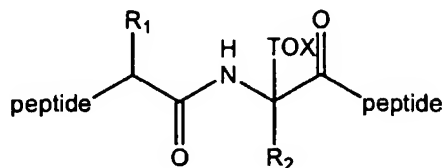


20 wherein R1 is unspecified or endopeptidase LA

wherein R2 is unspecified; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.21.72, the prodrug is a compound having the structure:

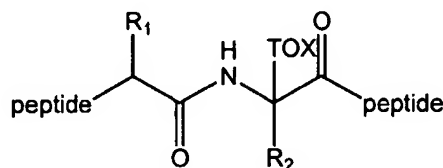


5            wherein R1 is pro in immunoglobulin A or IgA-specific serine endopeptidase;

             wherein R2 is unspecified; and

             wherein TOX is a toxoid.

             When the enzyme is of the subgroup 3.4.21.88, the prodrug is a  
10    compound having the structure:

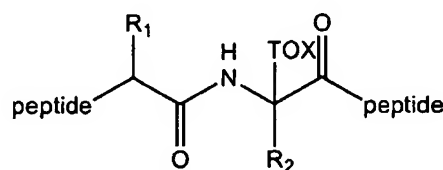


             wherein R1 is Ala84 in reprecursor lex A or repressor lexA peptidase;

             wherein R2 is unspecified; and

             wherein TOX is a toxoid.

15            When the enzyme is of the subgroup 3.4.21.89, the prodrug is a compound having the structure:

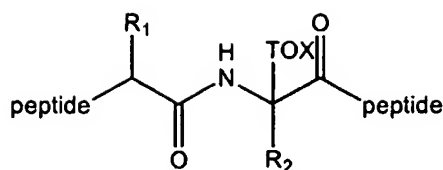


             wherein R1 is an N-terminal leader sequence in a signal peptide or signal peptidase I;

20            wherein R2 is unspecified; and

             wherein TOX is a toxoid.

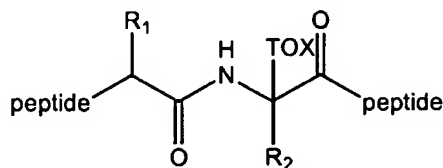
             When the enzyme is of the subgroup 3.4.23.23, and the prodrug is a compound having the structure:



wherein R1 and R2 are independently the same or different and is a hydrophobic side chain or mucorpepsin; and

wherein TOX is a toxoid.

- 5 When the enzyme is of the subgroup 3.4.23.36, the prodrug is a compound having the structure:

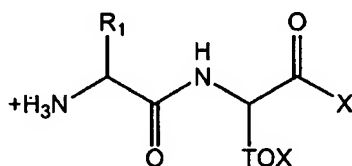


wherein R1 is unspecified;

wherein R2 is a cysteinyl side chain or signal peptidase II; and

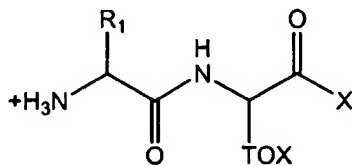
- 10 wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.24.X, wherein X is selected from the group consisting of 25, 26, 28, and 36, the prodrug is a compound having the structure:



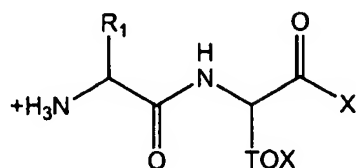
- 15 wherein R1 is unspecified; and  
wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.4.24.55, the prodrug is a compound having the structure:



- 20 wherein R1 is tyrosine or phenylalanine; and  
wherein TOX is a toxoid.

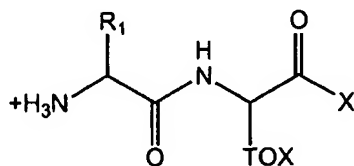
When the enzyme is of the subgroup 3.4.24.57, the prodrug is a compound having the structure:



wherein R1 is arginine; and

5 wherein TOX is a toxoid.

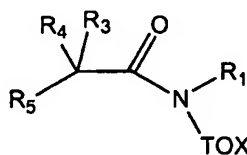
When the enzyme is of the subgroup 3.4.24.70, the prodrug is a compound having the structure:



wherein R1 is glycine or alanine; and

10 wherein TOX is a toxoid.

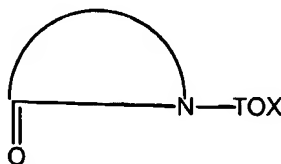
When the enzyme is of the subgroup 3.5.1.X, wherein X is selected from the group consisting of 1, 10, 11, 16, 18, 19, 24, 25, 31, 32, 38, 14, 46, 15, 54, 6, 68, 78, and 81, the prodrug is a compound having the structure:



15 wherein R1, R3, R4 and R5 are unspecified; and

wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.5.2.X, wherein X is selected from the group consisting of 5, 6, 7, and 10, the prodrug is a compound having the structure:

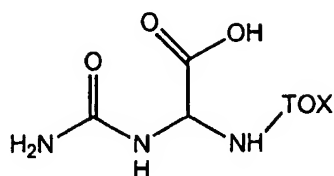


20

wherein TOX is a toxoid.

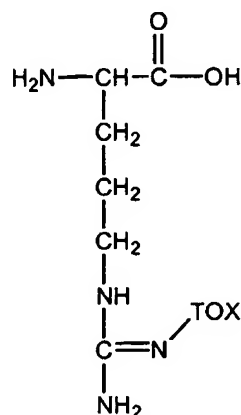


When the enzyme is of the subgroup 3.5.3.4, the prodrug is a compound having the structure:



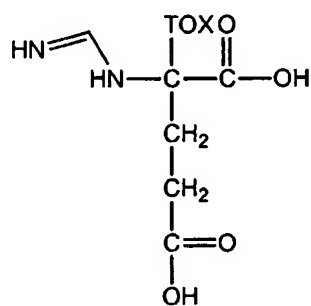
wherein TOX is a toxoid.

- 5 When the enzyme is of the subgroup 3.5.3.6, the prodrug is a compound having the structure:



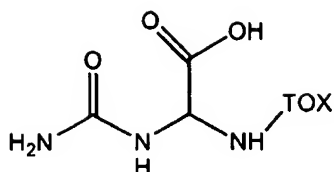
wherein TOX is a toxoid.

- 10 When the enzyme is of the subgroup 3.5.3.8, the prodrug is a compound having the structure:



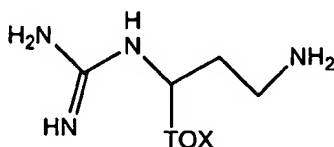
wherein TOX is a toxoid.

When the enzyme is of the subgroup 3.5.3.9, the prodrug is a compound having the structure:



wherein TOX is a toxoid.

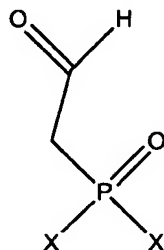
When the enzyme is of the subgroup 3.5.3.11, the prodrug is a compound having the structure:



5

wherein TOX is a toxoid.

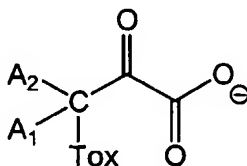
When the enzyme is of the subgroup 3.11.1.1, the prodrug is a compound having the structure:



10

wherein X is NHCH<sub>2</sub>CH<sub>2</sub>Cl.

When the enzyme is of the subgroup 4.1.1.1, the prodrug is a compound having the structure:

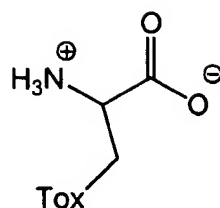


15

wherein A1 and A2 are independently the same or different and is unspecified; and

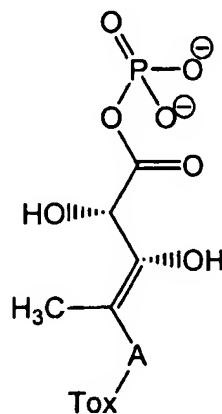
wherein TOX is a toxoid.

When the enzyme is of the subgroup 4.1.1.18, the prodrug is a compound having the structure:



wherein TOX is a toxoid.

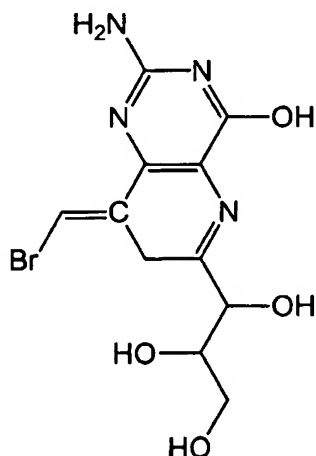
When the enzyme is of the subgroup 4.1.2.19, the prodrug is a compound having the structure:



5

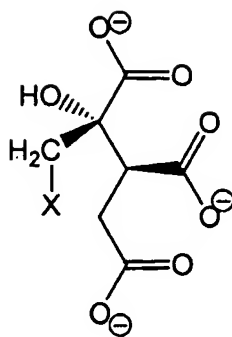
wherein TOX is a toxoid.

When the enzyme is of the subgroup 4.1.2.25, the prodrug is a compound having the structure:



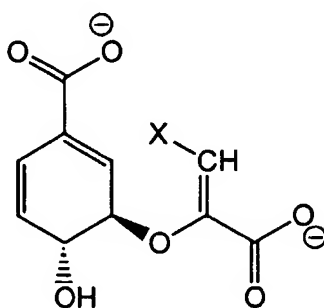
10

When the enzyme is of the subgroup 4.1.3.30, the prodrug is a compound having the structure:



wherein X is selected from the group consisting of Cl, Br, I and F.

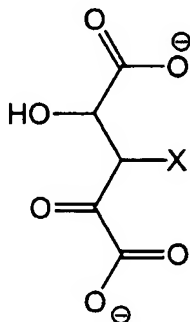
When the enzyme is of the subgroup 4.1.3.27, the prodrug is a compound having the structure:



5

wherein X is selected from the group consisting of Cl, Br, I and F.

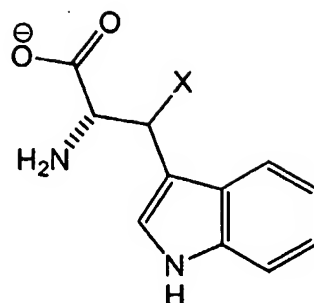
When the enzyme is of the subgroup 4.1.3.16, the prodrug is a compound having the structure:



10

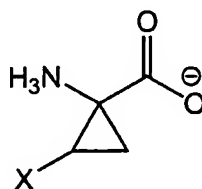
wherein X is selected from the group consisting of Cl, Br, I and F.

When the enzyme is of the subgroup 4.1.99.1, the prodrug is a compound having the structure:



wherein X is selected from the group consisting of Cl, Br, I and F.

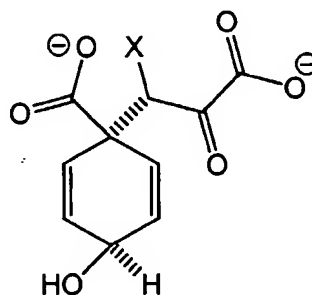
When the enzyme is of the subgroup 4.1.99.4, the prodrug is a compound having the structure:



5

wherein X is selected from the group consisting of Cl, Br, I and F.

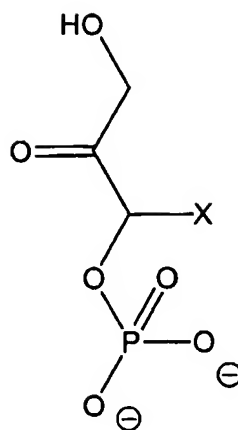
When the enzyme is of the subgroup 4.2.1.51, the prodrug is a compound having the structure:



10

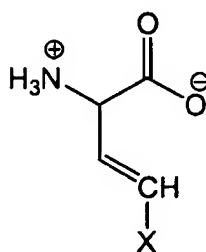
wherein X is selected from the group consisting of Cl, Br, I and F.

When the enzyme is of the subgroup 4.2.99.11, the prodrug is a compound having the structure:



wherein X is selected from the group consisting of Cl, Br, F or I.

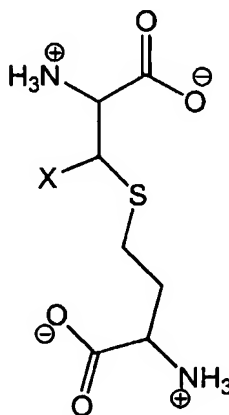
When the enzyme is of the subgroup 4.2.99.2, the prodrug is a compound having the structure:



5

wherein X is selected from the group consisting of Cl, Br, F or I.

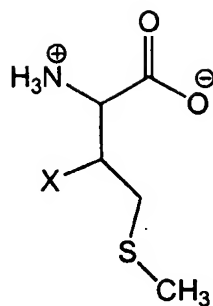
When the enzyme is of the subgroup 4.4.1.8, the prodrug is a compound having the structure:



10

wherein X is selected from the group consisting of Cl, Br, F or I.

When the enzyme is of the subgroup 4.4.1.11, the prodrug is a compound having the structure:



wherein X is selected from the group consisting of Cl, Br, F, and I.

While the invention has been described in detail and with reference to specific embodiments thereof, it will be apparent to one skilled in the art that  
5 various changes and modifications can be made therein without departing from the spirit and scope thereof.

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CLAIMS

1. A method for inhibiting the proliferation of a pathogen or a cell infected with an pathogen, wherein the pathogen expresses an iECTA enzyme, comprising contacting the pathogen or the cell with an effective amount of an iECTA prodrug that is activated to a toxin by the pathogen or in the cell by the iECTA enzyme, thereby inhibiting the proliferation of the pathogen or the cell.
2. The method of claim 1, wherein the iECTA enzyme is selected from the group of enzymes listed in Figures 7A and B and their biological equivalents.
3. The method of claim 2, wherein the iECTA enzymes beta-lactamase and peptide deformylase are specifically excluded.
4. The method of claim 1, wherein the iECTA enzyme is a member selected from the group consisting of the enzymes designated EC1, EC2, EC3, EC4, EC5, and EC6.
5. The method of claim 1, wherein the pathogen is selected from the group consisting of bacteria, parasites, rickettesia, virus, and fungus.
6. The method of claim 1, wherein the contacting is *in vitro* or *in vivo*.
7. A method for screening for a therapeutic agent that selectively inhibits the growth of pathogen or a pathogen-infected cell, comprising contacting the pathogen or the cell with an effective amount of an iECTA prodrug that is activated to a toxin by the pathogen or in the cell by the iECTA enzyme and assaying for inhibition growth of the pathogen or the cell.
8. The method of claim 7, wherein the iECTA enzyme is selected from the group of enzymes listed in Figures 7A and 7B, and their biological equivalents.

9. The method of claim 7, wherein the enzyme is a member of an enzyme selected from the group consisting of the enzymes designated EC1, EC2, EC3, EC4, EC5, and EC6.
- 5 10. The method of claim 7, wherein the iECTA enzymes beta-lactamase and peptide deformylase are specifically excluded.
11. The method of claim 7, wherein the enzyme is a member of the group consisting of the enzymes designated EC1, EC2, EC3, EC4, EC5, and EC6.
- 10 12. The method of claim 7, wherein the pathogen is selected from the group consisting of bacteria, parasites, rickettsia, virus, and fungus.
13. The method of claim 7, wherein the contacting is *in vitro* or *in vivo*.
14. The method of claim 7, further comprising delivering to a normal, non-infected counterpart cell to the infected host cell, an effective amount of the iECTA prodrug and assaying the normal, non-infected cell for  
15 inhibition of cell growth or cytotoxicity.
15. The method of claim 7, wherein the host cell is infected with a pathogen that expresses or induces the expression of an enzyme that is selectively expressed by the pathogen.
16. The method of claim 14, wherein the normal, non-infected counterpart is  
20 a plant cell or an animal cell.
17. The method of claim 16, wherein the animal cell is a mammalian cell.
18. A method for identifying drug targets, comprising:
  - a. searching a first data structure to obtain a first set of  
information, wherein the first set of information comprises first  
25 enzymes associated with a target organism or in a pathogen-infected cell;

- 5                   b. searching one or more data structures to obtain one or more sets of information, wherein the one or more sets of information comprises one or more expressed enzymes associated with one or more respective classes of organisms that is different than the target organism; and
- 10                   c. comparing the first set of information to the one or more sets of information to create a first output, wherein the first output comprises target enzymes in the first set of information that are not present in the one or more sets of information, and wherein the target enzymes are drug targets.
19. The method of claim 18, wherein the enzymes are expressed by the target organism or in a pathogen infected cell, but absent in the classes of organism of step b.
- 15                   20. The method of claim 18, wherein the target organism is selected from the group consisting of bacteria, parasites, rickettsia, virus, and fungus.
21. The method of claim 18, wherein the organism of step b is an animal or plant.
22. The method of claim 18, wherein the animal is a mammal.
- 20                   23. The method of claim 18, wherein the comparison step utilizes an alignment search algorithm.
24. The method of claim 18, wherein the alignment search algorithm is a Needleman-Wunsch global alignment algorithm, a Smith-Waterman local alignment algorithm, a "FAST" algorithm, or a BLAST
- 25                   algorithm.
25. The method of claim 18, further comprising the step of outputting a list of the target enzymes.

26. The method of claim 18, further comprising the step of comparing the first output to a data structure of metabolic enzymes, wherein the metabolic data structure contains enzymes present in metabolic pathways, to obtain a set of metabolic target enzymes, wherein the metabolic target enzymes are enzymes present in both the first output and in the metabolic data structure, and a set of non-metabolic target enzymes, wherein the non-metabolic target enzymes are enzymes present in the first output but not in the metabolic data structure.
27. The method of claim 26, further comprising the step of displaying the metabolic enzymes and the non-metabolic enzymes in a manner such that the metabolic enzymes are distinguishable from the non-metabolic enzymes.
28. The method of claim 18, wherein the searching steps utilize a network.
29. The method of claim 18, wherein the network is capable of searching the one or more data structures, wherein the one or more data structures are stored on a plurality of servers connected to the network.
30. The method of claim 18, wherein the comparing step utilizes a user's computer.
31. The method of claim 18, wherein the first set of information comprises information about Enzyme Commission numbers relating to the first set of enzymes associated with the target organism.
32. The method of claim 18, wherein the one or more data structures comprise information about Enzyme Commission numbers relating to the one or more expressed enzymes.
33. The method of claim 18, wherein the one or more data structures comprises a public domain database.

34. The method of claim 18, further comprising the additional step of using target enzymes to design iECTA compounds.

35. A method for identifying drug targets, the method comprising:

- 5           a. searching the first data structure to obtain the first set of information, wherein the first set of information comprises first enzymes associated with a target organism;
- b. searching a second data structure to obtain a second set of information, wherein the second set of information comprises second enzymes associated with a first class of organism;
- 10          c. comparing the first set of information to the second set of information to create the first output, wherein the first output comprises enzymes in the first set of information that are not present in the second set of information, and wherein the identified enzymes are drug targets;
- 15          d. searching a third data structure to obtain a third set of information relating to third expressed enzymes associated with a second class of organism, wherein the second class of organism is different from the first class of organism, wherein the third expressed enzymes are expressed at elevated levels in  
20           the second class of organism; and
- e. comparing the first output with the third set of information to create a second output, wherein the second output identifies enzymes in the first output that are not present in the third set of information, and wherein the target enzymes are drug  
25           targets.

36. The method of claim 35, further comprising repeating steps (d)-(e)  $n$  times, wherein there are  $n$  data structures.



37. The method of claim 35, wherein the drug targets are Enzyme Catalyzed Therapeutic Activation ("ECTA") targets.
38. The method of claim 35, wherein the comparison step utilizes an alignment search algorithm.
- 5 39. The method of claim 38, wherein the alignment search algorithm is a Needleman-Wunsch global alignment algorithm, a Smith-Waterman local alignment algorithm, a "FAST" algorithm, or a BLAST algorithm.
- 10 40. The method of claim 35, further comprising the step of outputting a list of the target enzymes.
41. The method of claim 35, further comprising the step of comparing the target enzymes to a data structure of metabolic enzymes, wherein the metabolic data structure contains enzymes present in metabolic pathways, to obtain a set of metabolic target enzymes, wherein the  
15 metabolic target enzymes are both target enzymes and present in the metabolic data structure, and a set of non-metabolic target enzymes, wherein the non-metabolic target enzymes are target enzymes but are not in the metabolic data structure.
- 20 42. The method of claim 41, further comprising the step of displaying the metabolic enzymes and the non-metabolic enzymes in a manner such that the metabolic enzymes are distinguishable from the non-metabolic enzymes.
43. The method of claim 35, wherein the searching steps utilize a network.
- 25 44. The method of claim 35, wherein the network is capable of searching the  $n$  data structures, wherein the  $n$  data structures are stored on a one or more servers connected to the network.

45. The method of claim 35, wherein the comparing steps utilize a user's computer.
46. The method of claim 35, wherein the first set of information comprises information about Enzyme Commission numbers relating to the first enzymes associated with the target organism.
47. The method of claim 35, wherein any of the  $n$  data structures in the group comprises information about Enzyme Commission numbers.
48. The method of claim 35, wherein any of the  $n$  data structures comprise a public domain database.
49. The method of claim 35, wherein the class of organism is an animal or a plant.
50. The method of claim 49, wherein the animal is a mammal.
51. The method of claim 35, further comprising the step of using the target enzymes to design ECTA compounds.
52. A system for identifying enzymes for designing Enzyme Catalyzed Therapeutic Activation (ECTA) compounds, comprising:
- a. searching a first data structure to obtain a first set of information, wherein the first set of information comprises first enzymes associated with a target organism;
  - b. searching one or more data structures to obtain one or more sets of information, wherein the one or more sets of information comprises one or logic for searching a first data structure to obtain a first set of information relating to one or more enzymes associated with a target organism;
  - c. logic for searching one or more other data structures to obtain one or more additional sets of information relating to one or

more expressed enzymes associated with one or more additional classes of organisms; and

- 5                   d. logic for comparing the first set of information to the one or more additional sets of information to identify enzymes in the first set of information that are not present in the one or more additional sets of information, wherein the identified enzymes are capable of being used to design ECTA compounds.

53. The system of claim 52, further comprising logic for outputting a list of the identified enzymes.

- 10           54. The system of claim 52, further comprising: logic for organizing the identified enzymes into a first set of enzymes capable of being placed into metabolic pathways and a second set of enzymes not capable of being placed into metabolic pathways; and logic for displaying the first and second sets of enzymes such that the first set of enzymes are  
15 distinguishable from the second set of enzymes.

55. The system of claim 52, wherein a third data structure is queried to organize the identified enzymes.

56. The system of claim 52, wherein a network is utilized to search at least one of the first data structure and the second data structure.

- 20           57. The system of claim 56, wherein the network is capable of communicating utilizing TCP/IP or IPX protocols.

58. The system of claim 52, wherein the information relating to the one or more enzymes of the target organism includes information about Enzyme Commission (EC) numbers of the one or more enzymes.

- 25           59. The system of claim 52, wherein the one or more additional sets of information relating to the one or more expressed enzymes associated with one or more classes of organisms includes information about

Enzyme Commission (EC) numbers of the one or more expressed enzymes.

- 5 60. A computer program product for identifying enzymes for designing Enzyme Catalyzed Therapeutic Activation (ECTA) compounds, comprising:
- a. computer code for searching a first data structure to obtain a first set of information relating to one or more enzymes associated with a target organism;
  - 10 b. computer code for searching one or more other data structures to obtain one or more additional sets of information relating to one or more expressed enzymes associated with one or more additional classes of organisms; and
  - 15 c. computer code for comparing the first set of information to the one or more additional sets of information to identify enzymes in the first set of information that are not present in the one or more additional sets of information, wherein the identified enzymes are capable of being used to design ECTA compounds.
- 20 61. The computer program product of claim 60, further comprising computer code for outputting a list of the identified enzymes.
- 25 62. The computer program product of claim 60, further comprising: computer code for organizing the identified enzymes into a first set of enzymes capable of being placed into metabolic pathways and a second set of enzymes not capable of being placed into metabolic pathways; and computer code for displaying the first and second sets

of enzymes such that the first set of enzymes are distinguishable from the second set of enzymes.

63. The computer program product of claim 60, wherein a third data structure is queried to organize the identified enzymes.

5 64. The computer program product of claim 60, wherein a network is utilized to search at least one of the first data structure and the second data structure.

65. The computer program product of claim 64, wherein the network is capable of communicating utilizing TCP/IP or IPX protocols.

10 66. The computer program product of claim 60, wherein the information relating to the one or more enzymes of the target organism includes information about Enzyme Commission (EC) numbers of the one or more enzymes.

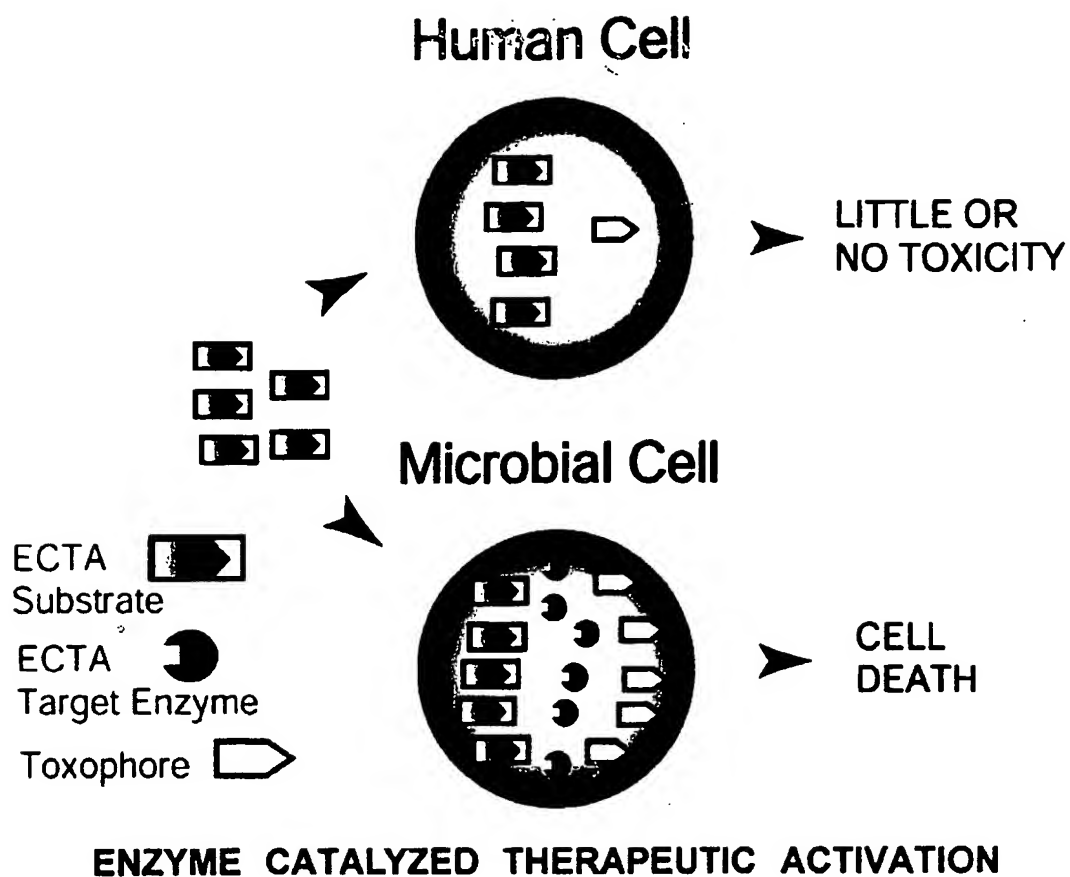
15 67. The computer program product of claim 60, wherein the one or more additional sets of information relating to the one or more expressed enzymes associated with one or more classes of organisms includes information about Enzyme Commission (EC) numbers of the one or more expressed enzymes.

20 68. A method for alleviating the symptoms of a disease related to an organism or host cell expressing an iECTA enzyme in a subject comprising administering to the subject an effective amount of an iECTA prodrug that is activated to a toxin in the organism or cell by the iECTA enzyme, thereby alleviating the symptoms.

25 69. The method of claim 68, wherein the iECTA enzyme is selected from the group of enzymes listed in Figures 7A and B and their biological equivalents.

70. The method of claim 69, wherein the iECTA enzymes beta-lactamase and peptide deformylase are specifically excluded.
71. The method of claim 69, wherein the iECTA enzyme is a member of an enzyme selected from the group consisting of the enzymes designated EC1, EC2, EC3, EC4, EC5, and EC6.
72. The method of claim 69, wherein the organism is selected from the group consisting of bacteria, parasites, rickettesia, virus, and fungus.
73. The method of claim 69, wherein the host is an animal or plant.
74. The method of claim 73, wherein the animal is a mammal.
75. A method for treating an infection caused by a pathogen expressing an iECTA enzyme or a host cell expressing an iECTA enzyme in a subject, comprising administering to the subject an effective amount of an iECTA prodrug that is activated to a toxin in the pathogen or cell by the iECTA enzyme, thereby alleviating the symptoms.
76. The method of claim 75, wherein the iECTA enzyme is selected from the group of enzymes listed in Figures 7A and B and their biological equivalents.
77. The method of claim 75, wherein the iECTA enzymes beta-lactamase and peptide deformylase are specifically excluded.
78. The method of claim 75, wherein the iECTA enzyme is a member of an enzyme selected from the group consisting of the enzymes designated EC1, EC2, EC3, EC4, EC5, and EC6.
79. The method of claim 75, wherein the organism is selected from the group consisting of bacteria, parasites, rickettesia, virus, and fungus.
80. The method of claim 75, wherein the host is an animal or plant.

81. The method of claim 80, wherein the animal is a mammal.



*Figure 1. ECTA technology utilizes preferentially expressed enzymes in pathogenic organisms to generate cytotoxins.*



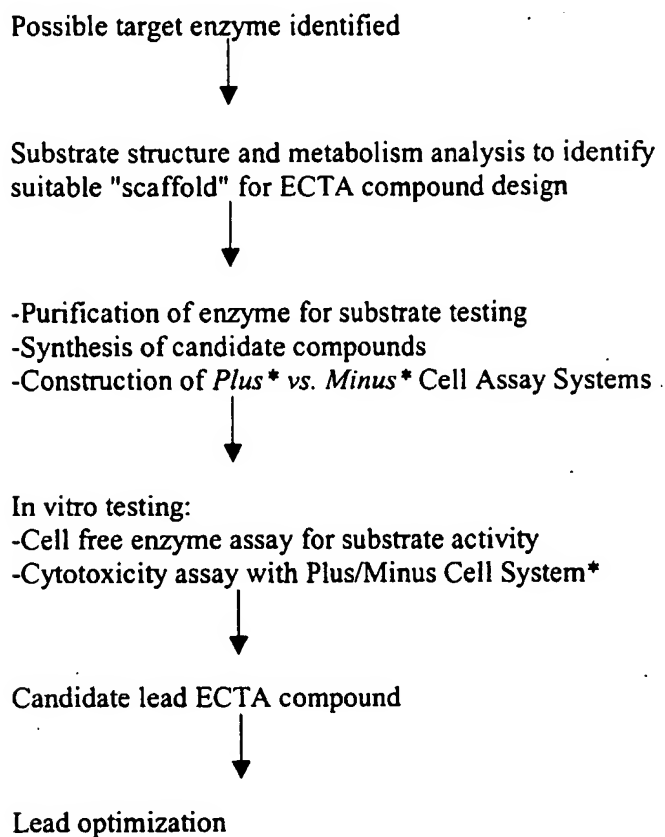
**Figure 2A. ECTA Enzyme Identification****Cancer**

- Plays role in disease aggressiveness.
- Overexpressed sufficiently to provide useful therapeutic index
- Must have non-overlapping substrate specificity, ie., probably not a member of an enzyme family. (Examples of preferred targets in cancer are given in Table 2A)

**Infectious Disease**

- Plays role in pathogen survival or pathogenicity.
- Expression restricted to pathogen or pathogen infected cells.
- Enzyme substrate specificity distinct from enzymes expressed by host.

**Figure 2B. Flow Chart for Identification of Potential ECTA Substrates. The process outlined below is representative of how target enzymes are chosen.**



\*Plus Cells: Selectively express or overexpress target enzyme

\*Minus Cells: Are relatively deficient in target enzyme expression

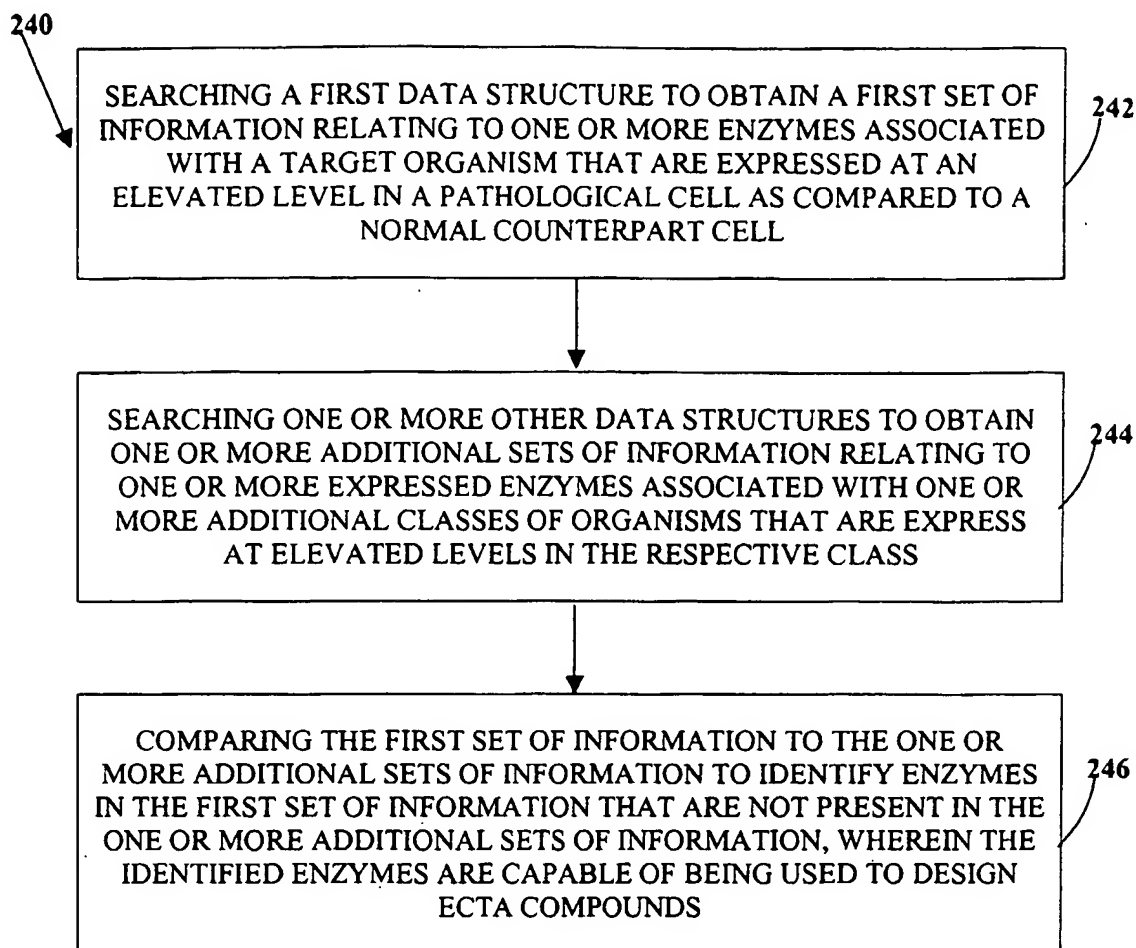
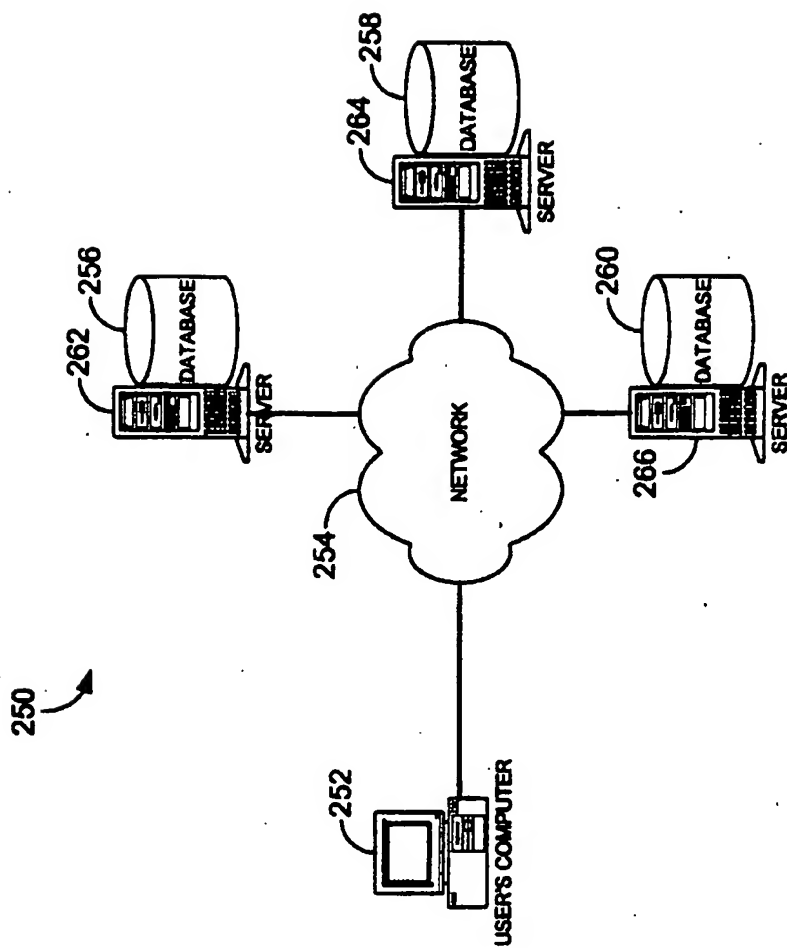
*Figure 2C*

Figure 2D



## Figure 3

TBLASTN 2.0.13

Query= RPA05873 [Pseudomonas aeruginosa] Contig46\_149439\_147766  
 ACETOLACTATE SYNTHASE LARGE SUBUNIT (EC 4.1.3.18)  
 (558 letters)

&lt;p&gt;

Database: GenBank Human EST entries

2,114,308 sequences; 797,293,801 total letters

Sequences producing significant alignments:			Score (bits)	E Value
gb AW732672.1	AW732672	bb11a04.y1 NIH_MGC_8 Homo sapiens cDNA cl...	98	1e-19
gb AI027531.1	AI027531	ow52c03.x1 Soares_parathyroid_tumor_NbHFA...	90	3e-17
gb AW301111.1	AW301111	xk13b12.x1 HCl_CGAP_Co20 Homo sapiens cDN...	82	6e-15
gb AW271472.1	AW271472	xs09e04.x1 HCl_CGAP_Kid11 Homo sapiens cD...	81	1e-14
gb AI188869.1	AI188869	qd27b09.x1 Soares_placenta_8to9weeks_2NbH...	78	9e-14
gb AI566186.1	AI566186	tq69e07.x1 HCl_CGAP_Lu19 Homo sapiens cDN...	78	1e-13
gb BE046629.1	BE046629	hn41b11.x1 HCl_CGAP_RDF2 Homo sapiens cDN...	77	3e-13
gb AI150763.1	AI150763	qc06e05.x1 Soares_fetal_heart_NbHH19W Hom...	70	2e-11
gb AA071233.1	AA071233	zm73h02.r1 Stratagene_neuroepithelium (#9...	65	1e-09
gb AA306411.1	AA306411	EST177435 Jurkat T-cells VI Homo sapiens ...	65	1e-09

Score = 98.0 bits (325), Expect = 1e-19

Identities = 60/175 (34%), Positives = 88/175 (50%)

Frame = +2

Query: 14 RNGGQILVEALRRHNAVDTVYCIPGESYLPVLDAIDYDTCIRTVVTRHGAASEMADAYGR 73  
 R+GG+ + LR + V ++ + G P+L A + GIR V TRHE ADA +  
 Sbjct: 8 RHGGENVAAVLRAHGVRFIPTLVGGHISPLLAC-EKLGIRVVDTRHEVTGVFAADAMAR 184

Query: 74 LTGRPGICFVTRGPGATHAANGVETAQODSTPMILFVGQVESAFKGRFAFQEVVDYVOMFS 133  
 L+G G+ VT GPG T+ V AQ +P++L G + + R A Q VD + +F  
 Sbjct: 185 LSGTVGVAAVTAGPGLTNTVTAVKHAQMAQSPILLGGAASTLLQNRGALQAVDQLSLFR 364

Query: 134 GLAKMAVEIDRIERIPFIVGRAFSVATSGRPGFVVVALFEEILFGSAQVADAFEP 188  
 L K+ V + R+ I + + A SG PGFV V LP ++L+ V P  
 Sbjct: 365 PLCKFCVSVFRVRDIVPTLRAXMAAASGTGPGFVVELPVDVLYPFFHVQKENVF 529

TBLASTN 2.0.13

*Figure 4*

Query= RPA07079 [Pseudomonas aeruginosa] Contig51\_766001\_766489  
 ACETOLACTATE SYNTHASE SMALL SUBUNIT (EC 4.1.3.18)  
 (163 letters)

<p>

Database: GenBank Human EST entries

2,114,308 sequences; 797,293,801 total letters

Score E

Sequences producing significant alignments:

(bits) Value

gb|AI444621.1|AI444621 FLC6554 Human fetal liver cDNA library Ho... 30 6.5

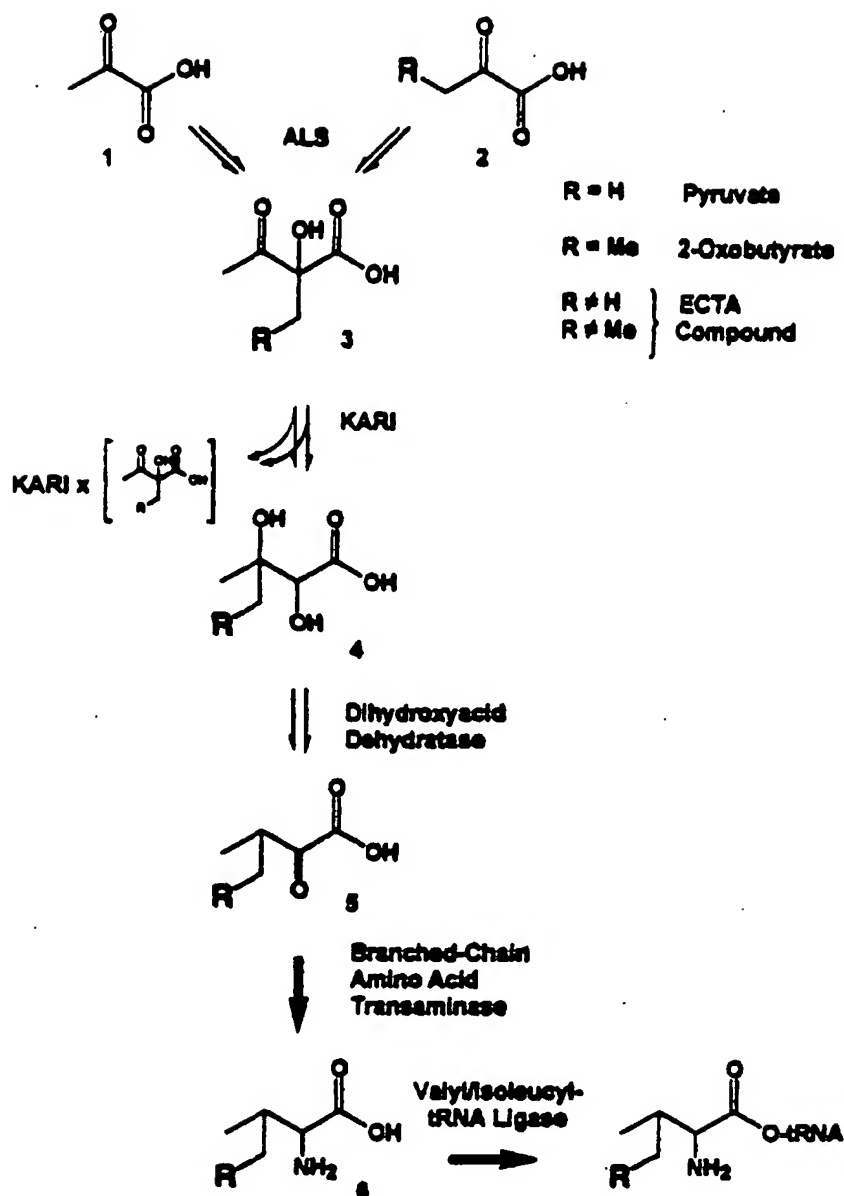
Score = 29.6 bits (87), Expect = 6.5

Identities = 18/54 (33%), Positives = 24/54 (44%)

Frame = +3

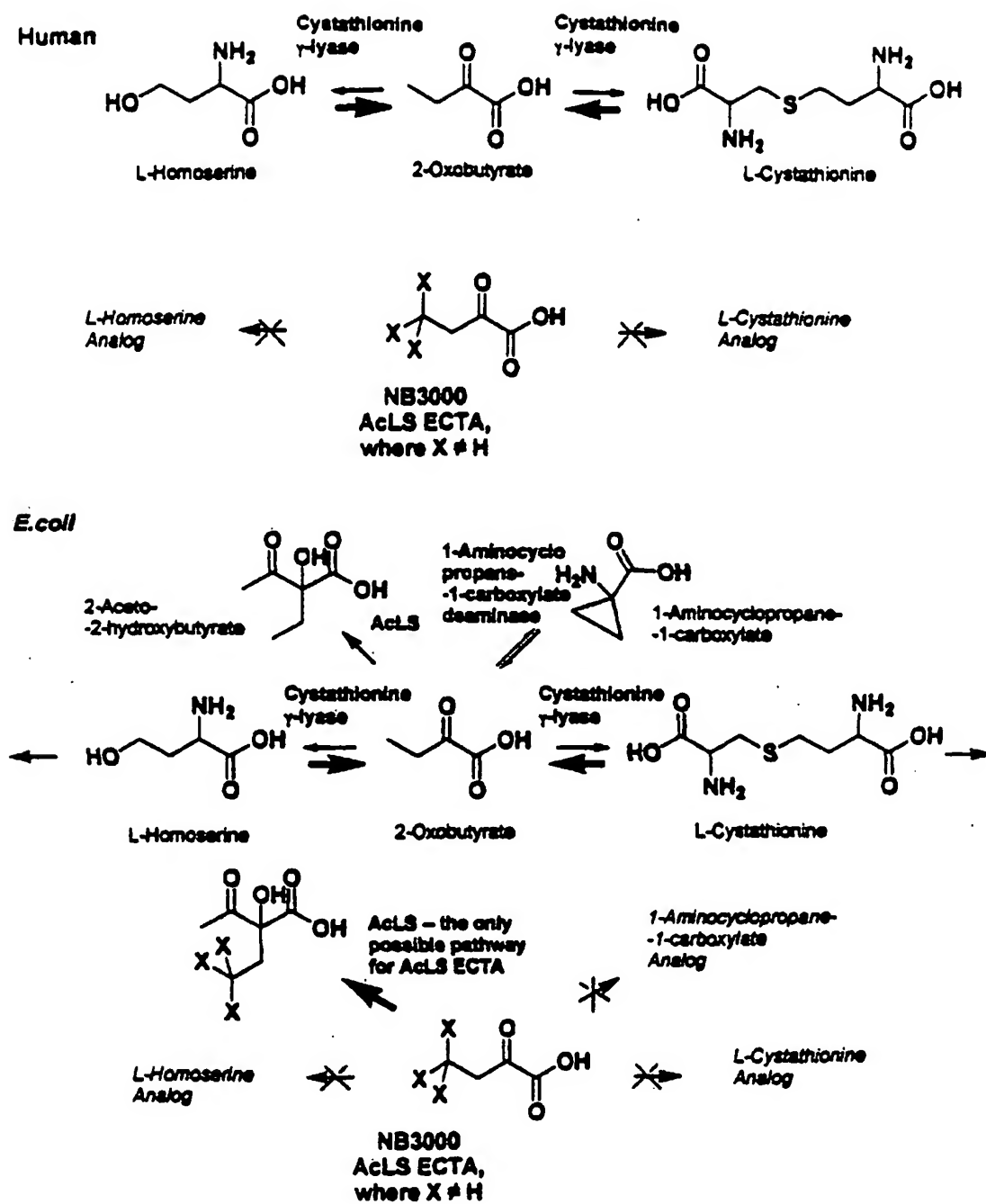
Query: 7 L L L E N E P G A L S R V V G L P S Q R N Y N I E S L T V A P T E D P L S R L T L T T V G H D E V I E Q I 60  
 L L L + P G + + L + R N N A D P L + G H E V + I  
 Sbjct: 72 L L L L S L P G L A G I T I L L T D R H L E T T T F D P A G G G D P I L Y Q H L F + I F G H P E V Y N R I 233

Figure 5



**Proposed mechanism of action of AcLS ECTA Compound.** Arrow pairs denote pathways present in bacteria and plants. Bold arrows denote general pathways (present in all organisms). Each step following the AcLS catalyzed formation of (3) could lead to formation of a toxic metabolite. The mechanism of toxicity could be via inhibition of the enzymes in the next steps of the metabolic pathway or via incorporation into cellular protein, resulting in nonfunctional products.

Figure 6



Comparison of 2-oxobutyrate metabolism in humans and E.coli. The arrows indicate equilibrium between substrate and product.



Figure 7A

I\_1\_1\_103 7706 *Yersinia pseudotuberculosis* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 171 *Yersinia pestis* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 7391 *Vibrio cholerae* El Tor N16961ORFA00618 THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 1685 *Salmonella typhimurium* tdh THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 1142 *Salmonella typhi* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 5894 *Salmonella paratyphi* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 1462 *Salmonella enteritidis* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 331 *Pasteurella multocida* D-BETA-HYDROXYBUTYRATE DEHYDROGENASE (EC I\_1\_1\_30) / THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103) / 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC I\_1\_1\_60)  
 I\_1\_1\_103 2117 *Klebsiella pneumoniae* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 2118 *Klebsiella pneumoniae* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 2151 *Haemophilus influenzae* HI1010 D-BETA-HYDROXYBUTYRATE DEHYDROGENASE (EC I\_1\_1\_30) / THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103) / 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC I\_1\_1\_60)  
 I\_1\_1\_103 6103 *Escherichia coli* tdh THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 2672 *Clostridium difficile* THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_103 1699 *Bacillus subtilis* tdh THREONINE 3-DEHYDROGENASE (EC I\_1\_1\_103)  
 I\_1\_1\_117 5819 *Saccharomyces cerevisiae* ARA1 D-ARABINOSE DEHYDROGENASE [NAD(P)+] HEAVY CHAIN (EC I\_1\_1\_117)  
 I\_1\_1\_122 1990 *Staphylococcus aureus* BS-yqkF D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 6068 *Salmonella typhimurium* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 3300 *Salmonella typhi* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 5201 *Salmonella typhi* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 4176 *Salmonella enteritidis* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 325 *Salmonella dublin* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 6860 *Saccharomyces cerevisiae* YMR041C D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 2545 *Mycobacterium leprae*trj007152 D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 1579 *Klebsiella pneumoniae* D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 2923 *Escherichia coli* b3001 D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 4461 *Escherichia coli* b0419 D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 5090 *Escherichia coli* b1771 D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 4333 *Bordetella pertussis* BS-yqkF D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 5664 *Bordetella bronchiseptica* BS-yqkF D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 278 *Bacillus subtilis* yccK D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_122 2358 *Bacillus subtilis* yqkF D-threo-aldose 1-dehydrogenase (EC I\_1\_1\_122)  
 I\_1\_1\_125 5491 *Yersinia pseudotuberculosis* EC-kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 6226 *Yersinia pseudotuberculosis* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 7387 *Yersinia pseudotuberculosis* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 3506 *Yersinia pestis* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 4839 *Yersinia pestis* EC-kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 4925 *Yersinia pestis* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 61 *Streptococcus pyogenes* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 1408 *Streptococcus pneumoniae* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 1132 *Streptococcus equi* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 5026 *Salmonella typhimurium* kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 2266 *Salmonella typhi* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 5126 *Salmonella paratyphi* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 2704 *Salmonella enteritidis* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 2728 *Salmonella dublin* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 6850 *Pseudomonas aeruginosa* PA4098 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 1913 *Klebsiella pneumoniae* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)  
 I\_1\_1\_125 1914 *Klebsiella pneumoniae* 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC I\_1\_1\_125)

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 1\_1\_1\_125 5692 *Escherichia coli* kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC 1\_1\_1\_125)  
 1\_1\_1\_125 1509 *Enterococcus faecium* (DOE) 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC 1\_1\_1\_125)  
 1\_1\_1\_125 3086 *Clostridium acetobutylicum* 36229712\_F1\_2 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC 1\_1\_1\_125)  
 1\_1\_1\_125 2211 *Bacillus subtilis* kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE (EC 1\_1\_1\_125)  
 1\_1\_1\_128 2873 *Salmonella typhimurium* idnD L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_128 2041 *Salmonella paratyphi* L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_128 2959 *Salmonella enteritidis* L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_128 4368 *Salmonella enteritidis* L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_128 6406 *Escherichia coli* yjgV L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_132 1698 *Pseudomonas aeruginosa* algD GDP-MANNOSE 6-DEHYDROGENASE (EC 1\_1\_1\_132)  
 1\_1\_1\_133 576 *Streptococcus pyogenes* rmlD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 184 *Streptococcus mutans* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 176 *Streptococcus equi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 6492 *Salmonella typhimurium* rfbD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 904 *Salmonella typhi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
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 1\_1\_1\_133 4890 *Salmonella paratyphi* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 3590 *Salmonella enteritidis* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 3295 *Salmonella dublin* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 326 *Rickettsia prowazekii* RP332 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1319 *Pseudomonas aeruginosa* rmlD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 3267 *Pseudomonas aeruginosa* PA4069 DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1382 *Porphyromonas gingivalis* BS-spsK DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1383 *Porphyromonas gingivalis* EC-rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1967 *Porphyromonas gingivalis* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1441 *Neisseria gonorrhoeae* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 2871 *Mycobacterium tuberculosis* rmlD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 2391 *Mycobacterium leprae* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1968 *Mycobacterium bovis* BS-spsK DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 433 *Klebsiella pneumoniae* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1661 *Klebsiella pneumoniae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 4831 *Klebsiella pneumoniae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 5235 *Escherichia coli* rfbD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 411 *Enterococcus faecium* (DOE) DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 513 *Enterococcus faecalis* EC-rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 515 *Enterococcus faecalis* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 392 *Corynebacterium diphtheriae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 360 *Clostridium acetobutylicum* 33406693\_F2\_52 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1166 *Clostridium acetobutylicum* 5865681\_C2\_40 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 1962 *Clostridium acetobutylicum* 4884636\_C2\_37 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

1\_1\_1\_133 2505 *Clostridium acetobutylicum* 1367952\_C3\_18 DTDP-4-DEHYDRORHAMNOSE 3,5-  
 EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 3570 *Bordetella pertussis* DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 7039 *Bordetella bronchiseptica* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) /  
 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_133 3775 *Bacillus subtilis* spsK DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) /  
 DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 1\_1\_1\_140 689 *Streptococcus mutans* Q9X671 SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_140 4868 *Salmonella typhimurium* gutD SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_140 941 *Salmonella typhi* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 2300 *Salmonella paratyphi* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 2301 *Salmonella paratyphi* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 1218 *Pasteurella multocida* EC-srID SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_140 356 *Klebsiella pneumoniae* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 3427 *Klebsiella pneumoniae* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 3428 *Klebsiella pneumoniae* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 2633 *Escherichia coli* srID SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 2372 *Enterococcus faecium* (DOE) SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_140 1656 *Enterococcus faecalis* SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC 1\_1\_1\_140)  
 1\_1\_1\_140 1378 *Clostridium difficile* EC-srID SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_154 5678 *Salmonella typhimurium* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 6615 *Salmonella typhimurium* alID UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 4079 *Salmonella typhi* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 5627 *Salmonella paratyphi* ureidoglycollate dehydrogenase (EC 1\_1\_1\_154)  
 1\_1\_1\_154 3899 *Salmonella enteritidis* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 4527 *Salmonella dublin* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 4706 *Salmonella dublin* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 6943 *Klebsiella pneumoniae* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 6944 *Klebsiella pneumoniae* ureidoglycollate dehydrogenase (EC 1\_1\_1\_154)  
 1\_1\_1\_154 4504 *Escherichia coli* b0517 UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 2528 *Bordetella pertussis* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 8196 *Bordetella bronchiseptica* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_154 1233 *Bacillus subtilis* yjmC UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_157 2474 *Pseudomonas aeruginosa* PA1628 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 2646 *Pseudomonas aeruginosa* PA3590 PROBABLE 3-HYDROXYBUTYRYL-COA  
 DEHYDROGENASE (EC 1\_1\_1\_157)  
 1\_1\_1\_157 1517 *Porphyromonas gingivalis* BS-mmGB 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 3584 *Mycobacterium tuberculosis* fadB3 PROBABLE 3-HYDROXYBUTYRYL-COA  
 DEHYDROGENASE (EC 1\_1\_1\_157)  
 1\_1\_1\_157 5511 *Mycobacterium tuberculosis* fadB2 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 2412 *Mycobacterium leprae* BS-mmGB 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 126 *Mycobacterium bovis* PROBABLE 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 701 *Mycobacterium bovis* BS-mmGB 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 6325 *Klebsiella pneumoniae* PROBABLE 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 6326 *Klebsiella pneumoniae* PROBABLE 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 1355 *Escherichia coli* b1395 PROBABLE 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_157 575 *Clostridium difficile* BS-mmGB 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)

I\_1\_1\_157 528 *Clostridium acetobutylicum* 30084417\_C1\_70 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_157 1700 *Bordetella pertussis* 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_157 2975 *Bordetella pertussis* 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_157 5148 *Bordetella bronchiseptica* 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_157 6474 *Bordetella bronchiseptica* 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_157 2411 *Bacillus subtilis* mmgB 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC I\_1\_1\_157)  
I\_1\_1\_158 6211 *Yersinia pseudotuberculosis* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 2178 *Yersinia pestis* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 4193 *Vibrio cholerae* El Tor N16961 ORF00448 UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 375 *Treponema pallidum* TP0047 UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 409 *Treponema pallidum* TP0090 UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 946 *Streptococcus pyogenes* murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 1278 *Streptococcus pneumoniae* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 632 *Streptococcus equi* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 1285 *Staphylococcus aureus* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 608 *Salmonella typhimurium* murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 1965 *Salmonella typhi* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 5017 *Salmonella paratyphi* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 5018 *Salmonella paratyphi* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 5019 *Salmonella paratyphi* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 2844 *Salmonella enteritidis* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 2910 *Salmonella dublin* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 242 *Rickettsia prowazekii* RP248 UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 6346 *Pseudomonas aeruginosa* murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 566 *Porphyromonas gingivalis* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 346 *Pasteurella multocida* murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 1130 *Neisseria gonorrhoeae* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 3358 *Mycobacterium tuberculosis* murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 392 *Mycobacterium leprae* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 686 *Mycobacterium bovis* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 1643 *Mycobacterium bovis* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 6404 *Klebsiella pneumoniae* UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)  
I\_1\_1\_158 805 *Helicobacter pylori* HP1418 UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE REDUCTASE (EC I\_1\_1\_158)

1\_1\_1\_158 1302 *Helicobacter pylori* J99sp|Q9ZJJ4 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 7840 *Haemophilus influenzae* HI0268 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1300 *Haemophilus ducreyi* EC-murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 3866 *Escherichia coli* murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE  
 (EC 1\_1\_1\_158)  
 1\_1\_1\_158 4029 *Enterococcus faecium* (DOE) UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1336 *Enterococcus faecalis* UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE (EC  
 1\_1\_1\_158)  
 1\_1\_1\_158 1577 *Enterococcus faecalis* UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE (EC  
 1\_1\_1\_158)  
 1\_1\_1\_158 2090 *Corynebacterium diphtheriae* UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 16 *Clostridium difficile* EC-murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1206 *Clostridium difficile* BS-yaaR UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 370 *Clostridium acetobutylicum* 23470001\_C1\_122 UDP-N-  
 ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1571 *Clostridium acetobutylicum* 25673593\_F3\_14 UDP-N-  
 ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 795 *Chlamydia trachomatis* D/UW-3/Cx murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 867 *Chlamydia pneumoniae* AR39 CP0867 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 914 *Chlamydia pneumoniae* CWL029 murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1015 *Campylobacter jejuni* murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 159 *Borrelia burgdorferi* BB0598 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 496 *Borrelia burgdorferi* BB0244 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 1014 *Bordetella pertussis*sp|Q9X6Y8 UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 8320 *Bordetella bronchiseptica* EC-murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_158 30 *Bacillus subtilis* yaaR UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE (EC  
 1\_1\_1\_158)  
 1\_1\_1\_158 1524 *Bacillus subtilis* murB UDP-N-ACETYLENOLPYRUVYOYLGLUCOSAMINE REDUCTASE  
 (EC 1\_1\_1\_158)  
 1\_1\_1\_159 3149 *Mycobacterium tuberculosis* Rv3485c 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE  
 (EC 1\_1\_1\_159)  
 1\_1\_1\_159 3376 *Mycobacterium bovis* EC-yciK 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC  
 1\_1\_1\_159)  
 1\_1\_1\_159 420 *Helicobacter pylori* HP1014 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC  
 1\_1\_1\_159)  
 1\_1\_1\_159 411 *Helicobacter pylori* J99 jhp0409 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC  
 1\_1\_1\_159)  
 1\_1\_1\_159 5014 *Escherichia coli* hdaA 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC 1\_1\_1\_159)  
 1\_1\_1\_159 853 *Clostridium difficile* 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC 1\_1\_1\_159)  
 1\_1\_1\_159 423 *Campylobacter jejuni* Cj0807 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC  
 1\_1\_1\_159)  
 1\_1\_1\_159 3762 *Bacillus subtilis* ywfH 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE (EC 1\_1\_1\_159)  
 1\_1\_1\_169 3121 *Yersinia pestis* EC-apbA 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 5469 *Yersinia pestis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 6075 *Vibrio cholerae* El Tor N16961 ORF02923 2-DEHYDROPANTOATE 2-REDUCTASE (EC  
 1\_1\_1\_169)  
 1\_1\_1\_169 882 *Streptococcus pyogenes* apbA 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)

1\_1\_1\_169 257 *Streptococcus equi* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2397 *Staphylococcus aureus* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2951 *Staphylococcus aureus* BS-ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 147 *Salmonella typhimurium* panE 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 5787 *Salmonella typhimurium* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 3029 *Salmonella typhi* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 3464 *Salmonella typhi* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 4717 *Salmonella paratyphi* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 5020 *Salmonella paratyphi* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 1578 *Salmonella enteritidis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 3669 *Salmonella dublin* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 3744 *Salmonella dublin* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 7955 *Pseudomonas aeruginosa* panE 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 75 *Porphyromonas gingivalis* BS-ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 483 *Mycobacterium tuberculosis* Rv2573 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2354 *Mycobacterium leprae* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 3913 *Mycobacterium bovis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2133 *Klebsiella pneumoniae* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2134 *Klebsiella pneumoniae* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 6763 *Klebsiella pneumoniae* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 4466 *Escherichia coli* apbA 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 1579 *Enterococcus faecium* (DOE) 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 8 *Enterococcus faecalis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 855 *Enterococcus faecalis* BS-ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2514 *Enterococcus faecalis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 191 *Corynebacterium diphtheriae* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 1096 *Clostridium difficile* BS-ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2472 *Clostridium acetobutylicum* 6025443\_F2\_7 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2668 *Clostridium acetobutylicum* 34656267\_F2\_3 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 2719 *Bordetella pertussis* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 5764 *Bordetella bronchiseptica* 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 9126 *Bordetella bronchiseptica* BS-ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 1445 *Bacillus subtilis* ykpB 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_169 1512 *Bacillus subtilis* ylbQ 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_17 2665 *Yersinia pestis* EC-mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 7546 *Vibrio cholerae* El Tor N16961ORFA00818 MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 29 *Streptococcus pneumoniae* EC-mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 121 *Streptococcus mutans* EC-mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 1944 *Staphylococcus aureus* EC-mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 5960 *Salmonella typhimurium* mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3221 *Salmonella typhi* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 4807 *Salmonella paratyphi* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 4808 *Salmonella paratyphi* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 4809 *Salmonella paratyphi* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3745 *Salmonella enteritidis* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 2641 *Salmonella dublin* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 1800 *Pasteurella multocida* mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 191 *Mycoplasma pneumoniae* MP190 MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3644 *Klebsiella pneumoniae* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3645 *Klebsiella pneumoniae* MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3520 *Escherichia coli* mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 3086 *Enterococcus faecium* (DOE) MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)

1\_1\_1\_17 1316 *Enterococcus faecalis* EC-mtID MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 2680 *Clostridium difficile* EC-mtID MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 2183 *Clostridium acetobutylicum* 5135967\_C1\_17 MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_17 400 *Bacillus subtilis* mtID MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_179 6589 *Yersinia pseudotuberculosis* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1516 *Yersinia pestis* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 62 *Streptococcus pyogenes* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1495 *Streptococcus pneumoniae* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1496 *Streptococcus pneumoniae* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 785 *Streptococcus mutans* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1131 *Streptococcus equi* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1871 *Salmonella typhimurium* ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 2667 *Salmonella typhi* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 4759 *Salmonella paratyphi* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 5732 *Saccharomyces cerevisiae* GRE3 D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1588 *Pasteurella multocida* BS-yvaA TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 3746 *Klebsiella pneumoniae* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 3747 *Klebsiella pneumoniae* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 6415 *Klebsiella pneumoniae* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 3010 *Escherichia coli* ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 3017 *Enterococcus faecium* (DOE) TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 551 *Enterococcus faecalis* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1595 *Enterococcus faecalis* BS-yrbE TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 2127 *Enterococcus faecalis* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 2678 *Enterococcus faecalis* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 1554 *Clostridium difficile* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 2661 *Clostridium acetobutylicum* 26853425\_C2\_14 TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 2712 *Clostridium acetobutylicum* 2349088\_F3\_11 TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 4327 *Clostridium acetobutylicum* TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_179 3111 *Bacillus subtilis* yulF TRANS-1,2-DIHYDROBENZENE-1,2-DIOL DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_18 6536 *Yersinia pseudotuberculosis* BS-yvaA MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 7739 *Yersinia pseudotuberculosis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 8177 *Yersinia pseudotuberculosis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 8181 *Yersinia pseudotuberculosis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)

1\_1\_1\_18 158 *Yersinia pestis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 1656 *Yersinia pestis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 3447 *Yersinia pestis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 3448 *Yersinia pestis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 6618 *Vibrio cholerae* El Tor N16961ORFA01017 MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 1715 *Streptococcus pneumoniae* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 2479 *Salmonella typhimurium* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 2619 *Salmonella typhimurium* ydgJ MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 5481 *Salmonella typhimurium* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 3422 *Salmonella paratyphi* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 1474 *Salmonella enteritidis* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 2953 *Klebsiella pneumoniae* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 6412 *Klebsiella pneumoniae* MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 1084 *Bacillus subtilis* yisS MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 2771 *Bacillus subtilis* yrbE MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_18 3963 *Bacillus subtilis* iolG MYO-INOSITOL 2-DEHYDROGENASE (EC 1\_1\_1\_18)  
 1\_1\_1\_193 4162 *Yersinia pseudotuberculosis* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 2738 *Yersinia pestis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 6045 *Vibrio cholerae* El Tor N16961 ORF02878  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1209 *Streptococcus pneumoniae* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 2886 *Staphylococcus aureus* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 3817 *Staphylococcus aureus* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 5139 *Salmonella typhimurium* ribG  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 4789 *Salmonella typhi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 4743 *Salmonella paratyphi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 4744 *Salmonella paratyphi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 5325 *Saccharomyces cerevisiae* RIB7 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1372 *Pseudomonas aeruginosa* ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 3169 *Pseudomonas aeruginosa* PA3469 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1441 *Porphyromonas gingivalis* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 669 *Pasteurella multocida* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)



1\_1\_1\_193 1383 *Neisseria gonorrhoeae* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 418 *Mycobacterium tuberculosis* ribG  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1752 *Mycobacterium leprae* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1230 *Mycobacterium bovis* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1404 *Mycobacterium bovis* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1440 *Klebsiella pneumoniae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1441 *Klebsiella pneumoniae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 8204 *Klebsiella pneumoniae* 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 885 *Helicobacter pylori* HP1505 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1385 *Helicobacter pylori* J99tr/Q9ZJB5  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 2004 *Haemophilus influenzae* HI0944  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 694 *Haemophilus ducreyi* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 398 *Escherichia coli* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1195 *Enterococcus faecalis* BS-ywjB 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 992 *Corynebacterium diphtheriae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 3269 *Clostridium difficile* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1406 *Clostridium acetobutylicum* 16182701\_C1\_42  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 1815 *Clostridium acetobutylicum* 24020077\_C1\_29 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 699 *Chlamydia trachomatis* D/UW-3/Cx EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 998 *Chlamydia pneumoniae* AR39 CP0998  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 803 *Chlamydia pneumoniae* CWL029 EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

1\_1\_1\_193 936 *Campylobacter jejuni* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE  
 DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC  
 1\_1\_1\_193)  
 1\_1\_1\_193 1610 *Bordetella pertussis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE  
 DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC  
 1\_1\_1\_193)  
 1\_1\_1\_193 8367 *Bordetella bronchiseptica* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-  
 (5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_193 2324 *Bacillus subtilis* ribG DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE  
 DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC  
 1\_1\_1\_193)  
 1\_1\_1\_193 3717 *Bacillus subtilis* ywjB 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE  
 (EC 1\_1\_1\_193)  
 1\_1\_1\_193 4070 *Bacillus subtilis* yyaP 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC  
 1\_1\_1\_193)  
 1\_1\_1\_195 3347 *Saccharomyces cerevisiae* YCR105W CINNAMYL-ALCOHOL DEHYDROGENASE (EC  
 1\_1\_1\_195)  
 1\_1\_1\_195 6078 *Saccharomyces cerevisiae* YMR318C CINNAMYL-ALCOHOL DEHYDROGENASE (EC  
 1\_1\_1\_195)  
 1\_1\_1\_202 721 *Streptococcus pneumoniae* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 3293 *Salmonella typhimurium* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 2625 *Salmonella typhi* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 43 *Salmonella paratyphi* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 44 *Salmonella paratyphi* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 45 *Salmonella paratyphi* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 2977 *Saccharomyces cerevisiae* ADH4 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 8280 *Pseudomonas aeruginosa* PA1991 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 74 *Klebsiella pneumoniae* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 5527 *Klebsiella pneumoniae* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 5528 *Klebsiella pneumoniae* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 6091 *Escherichia coli* yiaY 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 1007 *Enterococcus faecium* (DOE) 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 326 *Clostridium difficile* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_202 1727 *Clostridium acetobutylicum* 26271965\_F1\_4 1,3-PROPANEDIOL DEHYDROGENASE (EC  
 1\_1\_1\_202)  
 1\_1\_1\_202 8447 *Bordetella bronchiseptica* BS-gbsB 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_215 7594 *Yersinia pseudotuberculosis* EC-yiaE gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 1249 *Yersinia pestis* EC-yiaE gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 2566 *Salmonella typhi* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 1320 *Salmonella paratyphi* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 6327 *Pseudomonas aeruginosa* PA2263 gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 506 *Porphyromonas gingivalis* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 1847 *Klebsiella pneumoniae* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 1848 *Klebsiella pneumoniae* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 6512 *Escherichia coli* yiaE gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 3953 *Bordetella pertussis* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_215 8205 *Bordetella bronchiseptica* gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_218 1521 *Staphylococcus aureus* MORPHINE 6-DEHYDROGENASE (EC 1\_1\_1\_218)  
 1\_1\_1\_218 2935 *Salmonella typhimurium* MORPHINE 6-DEHYDROGENASE (EC 1\_1\_1\_218)  
 1\_1\_1\_218 5098 *Escherichia coli* b1781 MORPHINE 6-DEHYDROGENASE (EC 1\_1\_1\_218)  
 1\_1\_1\_23 7518 *Yersinia pseudotuberculosis* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 364 *Yersinia pestis* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 4959 *Vibrio cholerae* El Tor N16961 ORF01478 HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1158 *Streptococcus mutans* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1479 *Staphylococcus aureus* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 505 *Salmonella typhimurium* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 6941 *Salmonella typhimurium* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 4486 *Salmonella typhi* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1571 *Salmonella paratyphi* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1572 *Salmonella paratyphi* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1573 *Salmonella paratyphi* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)

1\_1\_1\_23 980 *Salmonella enteritidis* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 3213 *Salmonella dublin* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 6837 *Saccharomyces cerevisiae* HIS4 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 463 *Pseudomonas aeruginosa* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1890 *Pasteurella multocida* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 14 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 15 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 172 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 55 *Neisseria gonorrhoeae* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 2639 *Mycobacterium tuberculosis* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1687 *Mycobacterium leprae* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 2254 *Mycobacterium bovis* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 7760 *Klebsiella pneumoniae* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 7761 *Klebsiella pneumoniae* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 4636 *Haemophilus influenzae* HI0469 HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1968 *Escherichia coli* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 370 *Corynebacterium diphtheriae* HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 1828 *Clostridium difficile* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 2129 *Clostridium acetobutylicum* 1383588\_C3\_39 HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 893 *Campylobacter jejuni* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 761 *Bordetella pertussis* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 9514 *Bordetella bronchiseptica* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_23 3486 *Bacillus subtilis* hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_233 5523 *Yersinia pseudotuberculosis* N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC 1\_1\_1\_233)  
 1\_1\_1\_233 3768 *Yersinia pestis* N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC 1\_1\_1\_233)  
 1\_1\_1\_233 2795 *Mycobacterium tuberculosis* Rv3559c N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC 1\_1\_1\_233)  
 1\_1\_1\_233 2262 *Mycobacterium bovis* N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC 1\_1\_1\_233)  
 1\_1\_1\_233 3116 *Bacillus subtilis* yuxG N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC 1\_1\_1\_233)  
 1\_1\_1\_236 4453 *Bordetella pertussis* TROPINONE REDUCTASE-II (EC 1\_1\_1\_236)  
 1\_1\_1\_24 246 *Neurospora crassa* qa-3 QUINATE 5-DEHYDROGENASE (EC 1\_1\_1\_24)  
 1\_1\_1\_244 1536 *Streptococcus pneumoniae* NAD-DEPENDENT METHANOL DEHYDROGENASE (EC 1\_1\_1\_244)  
 1\_1\_1\_245 4533 *Mycobacterium tuberculosis* Rv0851c cyclohexanol dehydrogenase (EC 1\_1\_1\_245)  
 1\_1\_1\_25 5471 *Yersinia pseudotuberculosis* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 7159 *Yersinia pseudotuberculosis* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 484 *Yersinia pestis* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 951 *Yersinia pestis* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3940 *Vibrio cholerae* El Tor N16961 ORF00094 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 639 *Streptococcus pyogenes* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1155 *Streptococcus pyogenes* aroE\_2 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 385 *Streptococcus pneumoniae* BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1621 *Streptococcus mutans* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1385 *Streptococcus equi* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1342 *Staphylococcus aureus* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2211 *Staphylococcus aureus* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1219 *Salmonella typhimurium* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2023 *Salmonella typhimurium* ydiB SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2080 *Salmonella typhimurium* hi0607 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 32 *Salmonella typhi* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 5581 *Salmonella typhi* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 5942 *Salmonella paratyphi* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2869 *Salmonella enteritidis* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3001 *Salmonella enteritidis* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)

1\_1\_1\_25 3567 *Salmonella dublin* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 715 *Pseudomonas aeruginosa* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 6801 *Pseudomonas aeruginosa* PA0244 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1362 *Porphyromonas gingivalis* BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 116 *Pasteurella multocida* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 211 *Pasteurella multocida* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2108 *Neisseria gonorrhoeae* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 147 *Mycobacterium tuberculosis* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 439 *Mycobacterium leprae* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3160 *Mycobacterium bovis* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 821 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3809 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3810 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 3811 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 5997 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 5998 *Klebsiella pneumoniae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 644 *Helicobacter pylori* HP1249 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1159 *Helicobacter pylori* J99sp/Q9ZJX8 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 4955 *Haemophilus influenzae* HI0607 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 20520 *Haemophilus influenzae* HI0655 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 785 *Haemophilus ducreyi* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1649 *Escherichia coli* ydiB SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 5912 *Escherichia coli* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2220 *Enterococcus faecium* (DOE) SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1358 *Enterococcus faecalis* BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 440 *Corynebacterium diphtheriae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 748 *Corynebacterium diphtheriae* SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2021 *Clostridium difficile* EC-ydiB SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2416 *Clostridium difficile* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 1755 *Clostridium acetobutylicum* 25396927\_F1\_6 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 352 *Chlamydia trachomatis* D/UW-3/Cx BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 817 *Chlamydia pneumoniae* AR39 CP0817 SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 957 *Chlamydia pneumoniae* CWL029 BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2420 *Campylobacter jejuni* aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2424 *Bordetella pertussis* BS-aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_25 2559 *Bacillus subtilis* aroD SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_250 6682 *Yersinia pseudotuberculosis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 7943 *Yersinia pseudotuberculosis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 3204 *Yersinia pestis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 4915 *Yersinia pestis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 5193 *Yersinia pestis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 2018 *Streptococcus equi* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 3064 *Klebsiella pneumoniae* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 3065 *Klebsiella pneumoniae* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 3066 *Klebsiella pneumoniae* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 14547 *Haemophilus influenzae* HI0048 D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_250 1236 *Bacillus subtilis* yjmF D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_251 3106 *Salmonella typhi* GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_251)  
 1\_1\_1\_251 5809 *Salmonella paratyphi* GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_251)  
 1\_1\_1\_251 5811 *Salmonella paratyphi* GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_251)  
 1\_1\_1\_251 2345 *Klebsiella pneumoniae* GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_251)

1\_1\_1\_251 5271 *Escherichia coli* gatD GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_251)  
 1\_1\_1\_28 6363 *Yersinia pseudotuberculosis* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 6474 *Yersinia pseudotuberculosis* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 1420 *Yersinia pestis* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2857 *Yersinia pestis* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 6708 *Vibrio cholerae* El Tor N16961ORFA01138 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 367 *Treponema pallidum* TP0037 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 843 *Streptococcus pyogenes* ddh D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 3472 *Staphylococcus aureus* P72357 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 3846 *Staphylococcus aureus* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 4064 *Salmonella typhimurium* dld D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 6250 *Salmonella typhimurium* htpH D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 331 *Salmonella typhi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 3143 *Salmonella typhi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2071 *Salmonella paratyphi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2707 *Salmonella paratyphi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2708 *Salmonella paratyphi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2709 *Salmonella paratyphi* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 411 *Salmonella enteritidis* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 1051 *Salmonella dublin* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 4261 *Salmonella dublin* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 5556 *Pseudomonas aeruginosa* ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 20025 *Neurospora crassa* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 302 *Neisseria gonorrhoeae* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 1461 *Neisseria gonorrhoeae* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 4454 *Klebsiella pneumoniae* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 7297 *Klebsiella pneumoniae* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 7298 *Klebsiella pneumoniae* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 7299 *Klebsiella pneumoniae* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 11126 *Haemophilus influenzae* HI1649 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 14472 *Haemophilus influenzae* HI0085 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2082 *Escherichia coli* dld D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 4897 *Escherichia coli* ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 253 *Enterococcus faecium* (DOE) D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2413 *Enterococcus faecalis* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 3343 *Clostridium difficile* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 2878 *Clostridium acetobutylicum* 242937\_F2\_4 D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 322 *Bordetella pertussis* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_28 6665 *Bordetella bronchiseptica* D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_29 6261 *Vibrio cholerae* El Tor N16961 ORF03166 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 853 *Saccharomyces cerevisiae* YGL185C GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 8128 *Saccharomyces cerevisiae* YNL274C GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 4979 *Pseudomonas aeruginosa* hprA GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 1749 *Porphyromonas gingivalis* BS-yoaD GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 1729 *Neisseria gonorrhoeae* BS-yoaD GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 1053 *Helicobacter pylori* HP0096 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 92 *Helicobacter pylori* J99trQ9ZMX7 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 18618 *Haemophilus influenzae* HI1556 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 1913 *Clostridium acetobutylicum* 3908561\_C2\_39 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 3079 *Clostridium acetobutylicum* 32421927\_C1\_11 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_29 3463 *Bacillus subtilis* yvcT GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_3 6039 *Yersinia pseudotuberculosis* EC-metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 7401 *Yersinia pseudotuberculosis* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2352 *Yersinia pestis* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 5245 *Yersinia pestis* EC-metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 6131 *Vibrio cholerae* El Tor N16961 ORF02994 ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)

1\_1\_1\_3 6432 *Vibrio cholerae* El Tor N16961 ORF03393 ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1307 *Streptococcus pneumoniae* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 193 *Streptococcus equi* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1314 *Staphylococcus aureus* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3365 *Salmonella typhimurium* metM ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3762 *Salmonella typhimurium* thrA2 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 389 *Salmonella typhi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1334 *Salmonella typhi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 54 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 55 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 230 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4368 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4369 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4371 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4372 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4373 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1278 *Salmonella enteritidis* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3151 *Salmonella dublin* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3980 *Saccharomyces cerevisiae* HOM3 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 5916 *Saccharomyces cerevisiae* HOM6 HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 4170 *Pseudomonas aeruginosa* hom HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 472 *Pasteurella multocida* thrA ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 516 *Neisseria gonorrhoeae* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 909 *Mycobacterium tuberculosis* thrA HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1203 *Mycobacterium leprae* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1273 *Mycobacterium bovis* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2295 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2296 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2297 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2457 *Klebsiella pneumoniae* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 245 *Helicobacter pylori* HP0822 HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 760 *Helicobacter pylori* J99 hom HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 18061 *Haemophilus influenzae* HI0089 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2 *Escherichia coli* thrA ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3838 *Escherichia coli* metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2513 *Enterococcus faecalis* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1380 *Corynebacterium diphtheriae* HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 1830 *Clostridium difficile* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)

1\_1\_1\_3 1561 *Clostridium acetobutylicum* 23570152\_C1\_27 HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 2052 *Campylobacter jejuni* hom HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3120 *Bordetella pertussis* EC-metL HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_3 3221 *Bacillus subtilis* hom HOMOSERINE DEHYDROGENASE (EC 1\_1\_1\_3)  
 1\_1\_1\_31 7573 *Yersinia pseudotuberculosis* EC-yhaE 3-HYDROXYISOBUTYRATE DEHYDROGENASE  
 PRECURSOR (EC 1\_1\_1\_31)  
 1\_1\_1\_31 2088 *Yersinia pestis* BS-ykwC 3-HYDROXYISOBUTYRATE DEHYDROGENASE PRECURSOR (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 3196 *Salmonella typhimurium* yihU 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 4067 *Salmonella typhi* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 3649 *Salmonella paratyphi* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 3831 *Salmonella paratyphi* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 5767 *Salmonella paratyphi* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 778 *Pseudomonas aeruginosa* PA2199 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 3200 *Pseudomonas aeruginosa* mmsB 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 7186 *Pseudomonas aeruginosa* PA3312 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 8099 *Pseudomonas aeruginosa* PA1576 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 8533 *Pseudomonas aeruginosa* PA0743 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 65 *Neisseria gonorrhoeae* BS-ykwC 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 871 *Mycobacterium tuberculosis* Rv0770 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 4180 *Mycobacterium tuberculosis* mmsB 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 790 *Mycobacterium bovis* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 1158 *Mycobacterium bovis* EC-yihU 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 8440 *Klebsiella pneumoniae* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 586 *Helicobacter pylori* J99tr|Q9ZLJ4 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 6230 *Escherichia coli* yihU 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 2744 *Enterococcus faecium* (DOE) 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 2827 *Enterococcus faecalis* BS-ykwC 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 2031 *Corynebacterium diphtheriae* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 3614 *Clostridium acetobutylicum* 21490878\_C3\_9 3-HYDROXYISOBUTYRATE DEHYDROGENASE  
 (EC 1\_1\_1\_31)  
 1\_1\_1\_31 3603 *Bordetella pertussis* BS-ykwC 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 3922 *Bordetella pertussis* EC-yhaE 3-HYDROXYISOBUTYRATE DEHYDROGENASE PRECURSOR  
 (EC 1\_1\_1\_31)  
 1\_1\_1\_31 4351 *Bordetella pertussis* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 5367 *Bordetella bronchiseptica* 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_31 5972 *Bordetella bronchiseptica* 3-HYDROXYISOBUTYRATE DEHYDROGENASE PRECURSOR  
 (EC 1\_1\_1\_31)  
 1\_1\_1\_31 6990 *Bordetella bronchiseptica* 3-HYDROXYISOBUTYRATE DEHYDROGENASE PRECURSOR  
 (EC 1\_1\_1\_31)  
 1\_1\_1\_31 7295 *Bordetella bronchiseptica* BS-ykwC 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 7440 *Bordetella bronchiseptica* EC-yihU 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC  
 1\_1\_1\_31)  
 1\_1\_1\_31 799 *Bacillus subtilis* yfjR 3-HYDROXYISOBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_31)  
 1\_1\_1\_36 7197 *Vibrio cholerae* El Tor N16961ORFA00378 ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 3066 *Staphylococcus aureus* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 33 *Rickettsia prowazekii* RP035 ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)



1\_1\_1\_36 1194 *Mycobacterium tuberculosis* Rv2073c ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 1414 *Mycobacterium tuberculosis* Rv3791 ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 700 *Mycobacterium leprae* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 2063 *Mycobacterium leprae* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 284 *Mycobacterium bovis* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 6869 *Klebsiella pneumoniae* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 956 *Corynebacterium diphtheriae* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 1520 *Corynebacterium diphtheriae* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 1637 *Bordetella pertussis* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 3963 *Bordetella pertussis* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 7078 *Bordetella bronchiseptica* ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_36 9568 *Bordetella bronchiseptica* BS-yvaG ACETOACETYL-COA REDUCTASE (EC 1\_1\_1\_36)  
 1\_1\_1\_38 4354 *Yersinia pestis* PUTATIVE MALATE OXIDOREDUCTASE (EC 1\_1\_1\_38)  
 1\_1\_1\_38 4355 *Yersinia pestis* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 5014 *Vibrio cholerae* El Tor N16961 ORF01542 NAD-DEPENDENT MALIC ENZYME (EC 1\_1\_1\_38)  
 1\_1\_1\_38 41 *Streptococcus pyogenes* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 3296 *Staphylococcus aureus* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2094 *Salmonella typhimurium* maeA MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1074 *Salmonella paratyphi* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1181 *Salmonella paratyphi* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1182 *Salmonella paratyphi* PUTATIVE MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1183 *Salmonella paratyphi* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 805 *Salmonella enteritidis* NAD-DEPENDENT MALIC ENZYME (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2806 *Salmonella enteritidis* NAD-DEPENDENT MALIC ENZYME (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2026 *Salmonella dublin* NAD-DEPENDENT MALIC ENZYME (EC 1\_1\_1\_38)  
 1\_1\_1\_38 3234 *Saccharomyces cerevisiae* MAE1 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 366 *Rickettsia prowazekii* RP373 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 241 *Pseudomonas aeruginosa* PA3471 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1305 *Porphyromonas gingivalis* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1239 *Pasteurella multocida* mdh\_1 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 636 *Neisseria gonorrhoeae* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 65 *Mycobacterium leprae* PUTATIVE MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1199 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1200 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1201 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 8091 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 8092 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 8093 *Klebsiella pneumoniae* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 6231 *Haemophilus influenzae* HI1245 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 624 *Haemophilus ducreyi* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 4930 *Escherichia coli* sfcA NAD-DEPENDENT MALIC ENZYME (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1020 *Enterococcus faecalis* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1680 *Enterococcus faecalis* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1232 *Clostridium difficile* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 3605 *Clostridium acetobutylicum* 5079702\_F1\_2 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 3724 *Clostridium acetobutylicum* 22938813\_C3\_6 MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2660 *Campylobacter jejuni* Cj1287c MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 233 *Bordetella pertussis* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1159 *Bordetella pertussis* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 1517 *Bordetella pertussis* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 7334 *Bordetella bronchiseptica* MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 7867 *Bordetella bronchiseptica* BS-ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2351 *Bacillus subtilis* yqkJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_38 2916 *Bacillus subtilis* ytsJ MALATE OXIDOREDUCTASE (NAD) (EC 1\_1\_1\_38)  
 1\_1\_1\_4 6406 *Yersinia pseudotuberculosis* 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 4926 *Yersinia pestis* 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 4333 *Saccharomyces cerevisiae* YAL061W 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 4334 *Saccharomyces cerevisiae* YAL060W 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 6853 *Pseudomonas aeruginosa* PA4097 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 1072 *Neisseria gonorrhoeae* BS-ydjL 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)



1\_1\_1\_4 3777 *Mycobacterium bovis* BS-ydjL 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 1531 *Corynebacterium diphtheriae* 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_4 624 *Bacillus subtilis* ydjL 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_5 1649 *Streptococcus pyogenes* ACETOIN(DIACETYL) REDUCTASE (EC 1\_1\_1\_5)  
 1\_1\_1\_5 1801 *Streptococcus mutans* EC-srlD ACETOIN(DIACETYL) REDUCTASE (EC 1\_1\_1\_5)  
 1\_1\_1\_5 875 *Staphylococcus aureus* EC-srlD ACETOIN(DIACETYL) REDUCTASE (EC 1\_1\_1\_5)  
 1\_1\_1\_5 127 *Klebsiella pneumoniae* ACETOIN(DIACETYL) REDUCTASE (EC 1\_1\_1\_5)  
 1\_1\_1\_56 3415 *Klebsiella pneumoniae* RIBITOL 2-DEHYDROGENASE (EC 1\_1\_1\_56)  
 1\_1\_1\_56 117 *Clostridium acetobutylicum* 23600937\_C3\_164 RIBITOL 2-DEHYDROGENASE (EC 1\_1\_1\_56)  
 1\_1\_1\_57 6851 *Yersinia pseudotuberculosis* EC-yeiQ D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 792 *Yersinia pestis* EC-yeiQ D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 2522 *Salmonella typhimurium* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 6662 *Salmonella typhimurium* uxB D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 549 *Salmonella typhi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 3394 *Salmonella typhi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 3237 *Salmonella paratyphi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 5503 *Salmonella paratyphi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 5504 *Salmonella paratyphi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 5505 *Salmonella paratyphi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 5506 *Salmonella paratyphi* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 1935 *Salmonella enteritidis* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 3247 *Salmonella enteritidis* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 1225 *Klebsiella pneumoniae* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 3842 *Klebsiella pneumoniae* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 7596 *Klebsiella pneumoniae* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 7597 *Klebsiella pneumoniae* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 7598 *Klebsiella pneumoniae* D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 2121 *Escherichia coli* yeiQ D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 4206 *Escherichia coli* uxB D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_57 2082 *Clostridium acetobutylicum* 13912713\_F2\_11 FRUCTURONATE REDUCTASE (EC 1\_1\_1\_57)  
 1\_1\_1\_58 7696 *Yersinia pseudotuberculosis* EC-uxaB ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 3854 *Yersinia pestis* EC-uxaB ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 3791 *Klebsiella pneumoniae* ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 3793 *Klebsiella pneumoniae* ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 4964 *Escherichia coli* uxB ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 1911 *Enterococcus faecium* (DOE) EC-uxaB ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 1012 *Clostridium acetobutylicum* 12401675\_F3\_23 ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 1100 *Clostridium acetobutylicum* 32236432\_C1\_51 ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_58 1239 *Bacillus subtilis* yjml ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_6 6412 *Yersinia pseudotuberculosis* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 5146 *Yersinia pestis* EC-ybdH GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 714 *Streptococcus pyogenes* gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 225 *Streptococcus pneumoniae* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 465 *Streptococcus mutans* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 900 *Streptococcus mutans* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1397 *Streptococcus equi* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2679 *Salmonella typhimurium* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 3240 *Salmonella typhimurium* ybdH GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 3845 *Salmonella typhi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 5448 *Salmonella typhi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 274 *Salmonella paratyphi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 275 *Salmonella paratyphi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2586 *Salmonella paratyphi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2587 *Salmonella paratyphi* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1694 *Salmonella enteritidis* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2816 *Salmonella enteritidis* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2990 *Salmonella enteritidis* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1523 *Salmonella dublin* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1136 *Klebsiella pneumoniae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 3668 *Klebsiella pneumoniae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)

1\_1\_1\_6 7486 *Klebsiella pneumoniae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 7552 *Klebsiella pneumoniae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 7553 *Klebsiella pneumoniae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 4538 *Escherichia coli* ybdH GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 6262 *Escherichia coli* gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 367 *Enterococcus faecium* (DOE) GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 3523 *Enterococcus faecium* (DOE) GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 478 *Enterococcus faecalis* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 825 *Enterococcus faecalis* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2341 *Enterococcus faecalis* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1719 *Corynebacterium diphtheriae* GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 1735 *Clostridium acetobutylicum* 16594012\_C1\_43 GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_6 2870 *Bacillus subtilis* araM GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_60 4592 *Salmonella typhimurium* yhaE 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 6605 *Salmonella typhimurium* glxR 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 1396 *Salmonella typhi* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 1543 *Salmonella typhi* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 5609 *Salmonella paratyphi* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 5790 *Salmonella paratyphi* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 3003 *Salmonella enteritidis* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 4298 *Salmonella enteritidis* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 5340 *Salmonella enteritidis* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 2428 *Salmonella dublin* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 4457 *Salmonella dublin* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 3146 *Pseudomonas aeruginosa* PA1500 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 331 *Pasteurella multocida* D-BETA-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_30) / THREONINE 3-DEHYDROGENASE (EC 1\_1\_1\_103) / 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 3080 *Klebsiella pneumoniae* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 2151 *Haemophilus influenzae* HI1010 D-BETA-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_30) / THREONINE 3-DEHYDROGENASE (EC 1\_1\_1\_103) / 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 492 *Escherichia coli* b0509 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 5840 *Escherichia coli* yhaE 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 3509 *Clostridium difficile* EC-yhaE 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 5591 *Bordetella bronchiseptica* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 9497 *Bordetella bronchiseptica* 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_60 1397 *Bacillus subtilis* ykwC 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_61 6596 *Yersinia pseudotuberculosis* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 2160 *Yersinia pestis* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 3731 *Salmonella typhimurium* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 3720 *Salmonella typhi* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 3827 *Salmonella paratyphi* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 4943 *Salmonella enteritidis* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 3823 *Salmonella dublin* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 698 *Pseudomonas aeruginosa* PA5186 NAD-DEPENDENT 4-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_61 1718 *Pseudomonas aeruginosa* PA1146 NAD-DEPENDENT 4-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_61 463 *Porphyromonas gingivalis* NAD-DEPENDENT 4-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_61 337 *Pasteurella multocida* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 5751 *Haemophilus influenzae* HI1014 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_61 2687 *Clostridium difficile* NAD-DEPENDENT 4-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_61 2155 *Clostridium acetobutylicum* 20589675\_C1\_26 NAD-DEPENDENT 4-HYDROXYBUTYRATE DEHYDROGENASE (EC 1\_1\_1\_61)

1\_1\_1\_61 2154 *Bordetella pertussis* EC-yiaY NAD-DEPENDENT 4-HYDROXYBUTYRATE  
 DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_61 6139 *Bordetella bronchiseptica* EC-yiaY NAD-DEPENDENT 4-HYDROXYBUTYRATE  
 DEHYDROGENASE (EC 1\_1\_1\_61)  
 1\_1\_1\_67 6339 *Saccharomyces cerevisiae* YEL070W MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_67 7659 *Saccharomyces cerevisiae* YNR073C MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_67 1602 *Pseudomonas aeruginosa* mtID MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_67 4974 *Escherichia coli* b1542 MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_67 3136 *Enterococcus faecium* (DOE) MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_69 6602 *Yersinia pseudotuberculosis* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 2595 *Yersinia pestis* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 442 *Streptococcus pyogenes* idnO GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 727 *Streptococcus pneumoniae* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 1100 *Streptococcus equi* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 2040 *Salmonella paratyphi* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 4369 *Salmonella enteritidis* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 2616 *Pseudomonas aeruginosa* rhIG GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 1375 *Mycobacterium tuberculosis* Rv1928c GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 3583 *Mycobacterium tuberculosis* Rv1714 GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 125 *Mycobacterium bovis* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 3932 *Mycobacterium bovis* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 6405 *Escherichia coli* yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 2267 *Enterococcus faecium* (DOE) GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 396 *Enterococcus faecalis* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 1303 *Enterococcus faecalis* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 2894 *Bordetella pertussis* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 6825 *Bordetella bronchiseptica* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_69 8848 *Bordetella bronchiseptica* GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_77 7794 *Yersinia pseudotuberculosis* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 413 *Yersinia pestis* BS-gbsB LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 5532 *Salmonella typhimurium* fucO LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 3850 *Salmonella typhi* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 5994 *Salmonella paratyphi* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 5995 *Salmonella paratyphi* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 4651 *Salmonella enteritidis* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 4045 *Klebsiella pneumoniae* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 4046 *Klebsiella pneumoniae* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 4047 *Klebsiella pneumoniae* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 7261 *Klebsiella pneumoniae* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 5666 *Escherichia coli* fucO LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_77 3544 *Enterococcus faecium* (DOE) EC-fucO LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_81 6706 *Yersinia pseudotuberculosis* hydroxypyruvate reductase (EC 1\_1\_1\_81)  
 1\_1\_1\_81 2591 *Yersinia pestis* hydroxypyruvate reductase (EC 1\_1\_1\_81)  
 1\_1\_1\_82 2225 *Salmonella typhimurium* yiaK MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 2564 *Salmonella typhi* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 4528 *Salmonella paratyphi* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 2694 *Salmonella enteritidis* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 1594 *Salmonella dublin* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 4569 *Pseudomonas aeruginosa* PA1252 MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 900 *Pasteurella multocida* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 19683 *Haemophilus influenzae* HI1031 MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 3495 *Escherichia coli* b3575 MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 1552 *Enterococcus faecalis* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 1760 *Enterococcus faecalis* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 2427 *Clostridium acetobutylicum* 197142\_C2\_31 MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC  
 1\_1\_1\_82)  
 1\_1\_1\_82 1618 *Bordetella pertussis* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 1619 *Bordetella pertussis* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 1731 *Bordetella pertussis* BS-yjmC MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_82 5266 *Bordetella bronchiseptica* MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_85 5094 *Yersinia pseudotuberculosis* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 4730 *Yersinia pestis* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)

1\_1\_1\_85 6248 *Vibrio cholerae* El Tor N16961 ORF03147 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 356 *Streptococcus pneumoniae* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 357 *Streptococcus pneumoniae* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 1051 *Streptococcus mutans* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 3698 *Staphylococcus aureus* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 179 *Salmonella typhimurium* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 996 *Salmonella typhi* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 3570 *Salmonella paratyphi* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 559 *Salmonella enteritidis* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 2961 *Salmonella dublin* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 122 *Saccharomyces cerevisiae* LEU2 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 2259 *Pseudomonas aeruginosa* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 1212 *Pasteurella multocida* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 28 *Neurospora crassa* leu-1 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 1826 *Neisseria gonorrhoeae* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 3328 *Mycobacterium tuberculosis* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 2402 *Mycobacterium leprae* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 4246 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 4247 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 23 *Helicobacter pylori* J99 icd 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 9360 *Haemophilus influenzae* HI0987 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 4320 *Escherichia coli* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 1944 *Corynebacterium diphtheriae* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 547 *Clostridium difficile* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 2234 *Clostridium acetobutylicum* 892175\_C2\_27 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 1069 *Campylobacter jejuni* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 519 *Bordetella pertussis* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 7338 *Bordetella bronchiseptica* EC-leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 8332 *Bordetella bronchiseptica* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 401 *Bacillus subtilis* ycsA 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_85 2821 *Bacillus subtilis* leuB 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_86 5524 *Yersinia pseudotuberculosis* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2922 *Yersinia pestis* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 4045 *Vibrio cholerae* El Tor N16961 ORF00231 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 672 *Streptococcus pneumoniae* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 668 *Streptococcus mutans* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2410 *Staphylococcus aureus* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2296 *Salmonella typhimurium* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1391 *Salmonella typhi* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 5580 *Salmonella paratyphi* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 5581 *Salmonella paratyphi* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1158 *Salmonella enteritidis* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 4523 *Salmonella dublin* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 3233 *Saccharomyces cerevisiae* ILV5 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 3441 *Pseudomonas aeruginosa* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1918 *Pasteurella multocida* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 177 *Neurospora crassa* ilv2 KETOL-ACID REDUCTOISOMERASE PRECURSOR (EC 1\_1\_1\_86)  
 1\_1\_1\_86 20571 *Neurospora crassa* KETOL-ACID REDUCTOISOMERASE PRECURSOR (EC 1\_1\_1\_86)  
 1\_1\_1\_86 654 *Neisseria gonorrhoeae* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 3594 *Mycobacterium tuberculosis* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2100 *Mycobacterium leprae* sp|O33114 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2993 *Mycobacterium bovis* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 4033 *Klebsiella pneumoniae* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 4034 *Klebsiella pneumoniae* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1276 *Helicobacter pylori* HP0330 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 318 *Helicobacter pylori* J99tr|Q9ZMA9 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1488 *Haemophilus influenzae* HI0682 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 3686 *Escherichia coli* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 1949 *Corynebacterium diphtheriae* KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)

1\_1\_1\_86 1132 *Clostridium difficile* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 448 *Clostridium acetobutylicum* 6557\_C3\_87 KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 6 *Campylobacter jejuni* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 3074 *Bordetella pertussis* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 8804 *Bordetella bronchiseptica* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_86 2823 *Bacillus subtilis* ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_88 1236 *Streptococcus pyogenes* mvaS\_1 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A  
 REDUCTASE (EC 1\_1\_1\_88)  
 1\_1\_1\_88 923 *Streptococcus pneumoniae* 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE  
 (EC 1\_1\_1\_88)  
 1\_1\_1\_88 551 *Streptococcus mutans* 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE (EC  
 1\_1\_1\_88)  
 1\_1\_1\_88 1071 *Streptococcus equi* 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE (EC  
 1\_1\_1\_88)  
 1\_1\_1\_88 3426 *Staphylococcus aureus* 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE  
 (EC 1\_1\_1\_88)  
 1\_1\_1\_88 1963 *Enterococcus faecium* (DOE) ACETYL-COA ACETYLTRANSFERASE (EC 2\_3\_1\_9) / 3-  
 HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE (EC 1\_1\_1\_88)  
 1\_1\_1\_88 484 *Enterococcus faecalis* BS-mmga ACETYL-COA ACETYLTRANSFERASE (EC 2\_3\_1\_9) / 3-  
 HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE (EC 1\_1\_1\_88)  
 1\_1\_1\_88 76 *Borrelia burgdorferi* BB0685 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A  
 REDUCTASE (EC 1\_1\_1\_88)  
 1\_1\_1\_9 7941 *Saccharomyces cerevisiae* YLR070C D-XYLULOSE REDUCTASE (EC 1\_1\_1\_9)  
 1\_1\_1\_90 8244 *Klebsiella pneumoniae* ARYL-ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_90)  
 1\_1\_1\_90 8245 *Klebsiella pneumoniae* ARYL-ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_90)  
 1\_1\_1\_91 5043 *Salmonella paratyphi* ARYL-ALCOHOL DEHYDROGENASE (NADP+) (EC 1\_1\_1\_91)  
 1\_1\_1\_91 724 *Saccharomyces cerevisiae* AAD10 ARYL-ALCOHOL DEHYDROGENASE (NADP+) (EC  
 1\_1\_1\_91)  
 1\_1\_1\_91 6162 *Saccharomyces cerevisiae* AAD14 ARYL-ALCOHOL DEHYDROGENASE (NADP+) (EC  
 1\_1\_1\_91)  
 1\_1\_1\_91 8518 *Saccharomyces cerevisiae* AAD4 ARYL-ALCOHOL DEHYDROGENASE (NADP+) (EC  
 1\_1\_1\_91)  
 1\_1\_1\_93 6131 *Yersinia pseudotuberculosis* BS-ycsA PROBABLE TARTRATE DEHYDROGENASE (EC  
 1\_1\_1\_93)  
 1\_1\_1\_93 698 *Yersinia pestis* BS-ycsA tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 1773 *Saccharomyces cerevisiae* LYS12 tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 1556 *Klebsiella pneumoniae* tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 1557 *Klebsiella pneumoniae* tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 1558 *Klebsiella pneumoniae* tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 1757 *Escherichia coli* b1800 tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 2021 *Bordetella pertussis* BS-ycsA tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 5469 *Bordetella bronchiseptica* tartrate dehydrogenase (EC 1\_1\_1\_93)  
 1\_1\_1\_93 9062 *Bordetella bronchiseptica* BS-ycsA PROBABLE TARTRATE DEHYDROGENASE (EC  
 1\_1\_1\_93)  
 1\_1\_1\_94 271 *Yersinia pestis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC  
 1\_1\_1\_94)  
 1\_1\_1\_94 524 *Ureaplasma urealyticum* UU382 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+)  
 (EC 1\_1\_1\_94)  
 1\_1\_1\_94 768 *Treponema pallidum* TP1009 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC  
 1\_1\_1\_94)  
 1\_1\_1\_94 598 *Streptococcus pyogenes* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC  
 1\_1\_1\_94)  
 1\_1\_1\_94 1286 *Streptococcus pneumoniae* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE  
 (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1523 *Streptococcus mutans* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+)  
 (EC 1\_1\_1\_94)  
 1\_1\_1\_94 733 *Streptococcus equi* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC  
 1\_1\_1\_94)  
 1\_1\_1\_94 1200 *Staphylococcus aureus* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+)  
 (EC 1\_1\_1\_94)  
 1\_1\_1\_94 5944 *Salmonella typhimurium* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+)  
 (EC 1\_1\_1\_94)

1\_1\_1\_94 5514 *Salmonella typhi* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 4177 *Salmonella paratyphi* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 4178 *Salmonella paratyphi* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 3702 *Salmonella dublin* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 433 *Rickettsia prowazekii* RP442 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 8121 *Pseudomonas aeruginosa* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 257 *Porphyromonas gingivalis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 118 *Pasteurella multocida* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 496 *Neisseria gonorrhoeae* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 5523 *Mycobacterium tuberculosis* gpdA1 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 5954 *Mycobacterium tuberculosis* gpdA2 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2284 *Mycobacterium leprae* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 426 *Mycobacterium bovis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1533 *Mycobacterium bovis* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1534 *Mycobacterium bovis* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2577 *Klebsiella pneumoniae* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2578 *Klebsiella pneumoniae* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 374 *Helicobacter pylori* HP0961 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 892 *Helicobacter pylori* J99tr|Q9ZKP0 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 8594 *Haemophilus influenzae* HI0605 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1508 *Haemophilus ducreyi* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 6098 *Escherichia coli* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 852 *Enterococcus faecium* (DOE) GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2898 *Enterococcus faecalis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1927 *Corynebacterium diphtheriae* GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 705 *Clostridium difficile* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2392 *Clostridium acetobutylicum* 24881260\_C2\_27 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 683 *Chlamydia trachomatis* D/UW-3/Cx EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 1014 *Chlamydia pneumoniae* AR39 CP1014 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 787 *Chlamydia pneumoniae* CWL029 EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 2503 *Campylobacter jejuni* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_1\_94 381 *Borrelia burgdorferi* BB0368 GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)

I\_1\_1\_94 2044 *Bordetella pertussis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 I\_1\_1\_94 2279 *Bacillus subtilis* gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 I\_1\_2\_3 5868 *Yersinia pseudotuberculosis* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 1314 *Yersinia pestis* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 7484 *Vibrio cholerae* El Tor N16961ORFA00736 L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 5219 *Salmonella typhimurium* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 5949 *Salmonella typhimurium* lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 547 *Salmonella typhi* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2060 *Salmonella typhi* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 366 *Salmonella paratyphi* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2021 *Salmonella paratyphi* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2126 *Salmonella enteritidis* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 4658 *Salmonella dublin* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 3063 *Saccharomyces cerevisiae* CYB2 CYTOCHROME B2 PRECURSOR (EC 1\_1\_2\_3)  
 I\_1\_2\_3 1256 *Pseudomonas aeruginosa* lldA L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2040 *Pseudomonas aeruginosa* lldD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 1334 *Pasteurella multocida* lldD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 48 *Neisseria gonorrhoeae* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 4088 *Mycobacterium tuberculosis* lldD2 L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2712 *Mycobacterium leprae* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 617 *Mycobacterium bovis* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2573 *Klebsiella pneumoniae* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 18238 *Haemophilus influenzae* sp|P46454 L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 1302 *Haemophilus ducreyi* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 3525 *Escherichia coli* lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 631 *Enterococcus faecium* (DOE) L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 2880 *Bordetella pertussis* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 4007 *Bordetella pertussis* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 4452 *Bordetella pertussis* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 7568 *Bordetella bronchiseptica* L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_3 9132 *Bordetella bronchiseptica* EC-lctD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 I\_1\_2\_4 7485 *Vibrio cholerae* El Tor N16961ORFA00737 D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 3339 *Saccharomyces cerevisiae* DLD1 D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)  
 I\_1\_2\_4 6088 *Saccharomyces cerevisiae* DLD3 PROBABLE D-LACTATE DEHYDROGENASE [CYTOCHROME] (EC 1\_1\_2\_4)  
 I\_1\_2\_4 4407 *Pseudomonas aeruginosa* PA3026 D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)  
 I\_1\_2\_4 5243 *Pseudomonas aeruginosa* PA4772 D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 3920 *Mycobacterium tuberculosis* Rv2251 D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)  
 I\_1\_2\_4 7972 *Klebsiella pneumoniae* D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)  
 I\_1\_2\_4 618 *Helicobacter pylori* HP1222 D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 1133 *Helicobacter pylori* J99 dld D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 5648 *Escherichia coli* b2773 D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 1345 *Clostridium difficile* EC-glcD D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)

I\_1\_2\_4 1765 *Clostridium acetobutylicum* 33214008\_C2\_41 D-LACTATE DEHYDROGENASE (CYTOCHROME) PRECURSOR (EC 1\_1\_2\_4)  
 I\_1\_2\_4 874 *Campylobacter jejuni* Cj1585c D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 3396 *Bordetella pertussis* D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 6970 *Bordetella bronchiseptica* D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_2\_4 2862 *Bacillus subtilis* ysfC D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 I\_1\_3\_24 5908 *Saccharomyces cerevisiae* ALO1 L-GALACTONOLACTONE OXIDASE (EC 1\_1\_3\_24) / D-ARABINONO-1,4-LACTONE OXIDASE (EC 1\_1\_3\_37)  
 I\_1\_3\_37 5908 *Saccharomyces cerevisiae* ALO1 L-GALACTONOLACTONE OXIDASE (EC 1\_1\_3\_24) / D-ARABINONO-1,4-LACTONE OXIDASE (EC 1\_1\_3\_37)  
 I\_1\_3\_6 1934 *Mycobacterium tuberculosis* choD CHOLESTEROL OXIDASE PRECURSOR (EC 1\_1\_3\_6)  
 I\_1\_3\_6 1224 *Mycobacterium leprae*trjQ59530 CHOLESTEROL OXIDASE PRECURSOR (EC 1\_1\_3\_6)  
 I\_1\_3\_6 3794 *Mycobacterium bovis* CHOLESTEROL OXIDASE PRECURSOR (EC 1\_1\_3\_6)  
 I\_1\_3\_6 3795 *Mycobacterium bovis* CHOLESTEROL OXIDASE PRECURSOR (EC 1\_1\_3\_6)  
 I\_1\_3\_8 3056 *Mycobacterium tuberculosis* Rv3790 L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_8 701 *Mycobacterium leprae* L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_8 3240 *Mycobacterium leprae* L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_8 283 *Mycobacterium bovis* L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_8 957 *Corynebacterium diphtheriae* L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_8 1118 *Bacillus subtilis* yitY L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 I\_1\_3\_9 4256 *Clostridium acetobutylicum* GALACTOSE OXIDASE PRECURSOR (EC 1\_1\_3\_9)  
 I\_1\_99\_10 20148 *Neurospora crassa* GLUCOSE DEHYDROGENASE (ACCEPTOR) PRECURSOR (EC 1\_1\_99\_10)  
 I\_1\_99\_10 1284 *Mycobacterium tuberculosis* Rv1279 GLUCOSE DEHYDROGENASE (ACCEPTOR) (EC 1\_1\_99\_10)  
 I\_1\_99\_16 1142 *Staphylococcus aureus* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 2892 *Staphylococcus aureus* EC-yojH MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 4488 *Pseudomonas aeruginosa* mqoB MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 7524 *Pseudomonas aeruginosa* mqoA MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 2176 *Neisseria gonorrhoeae* EC-yojH MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 1834 *Mycobacterium tuberculosis* Rv2852c MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 1135 *Mycobacterium bovis* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 1240 *Mycobacterium bovis* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 3068 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 3069 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 3492 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 3493 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 9090 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 9091 *Klebsiella pneumoniae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 1355 *Haemophilus ducreyi* EC-yojH MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 5342 *Escherichia coli* yojH MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_16 2219 *Corynebacterium diphtheriae* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 I\_1\_99\_17 3487 *Salmonella typhimurium* yliI GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE) PRECURSOR (EC 1\_1\_99\_17)  
 I\_1\_99\_17 4426 *Salmonella typhimurium* gcd GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC 1\_1\_99\_17)  
 I\_1\_99\_17 668 *Salmonella typhi* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE) PRECURSOR (EC 1\_1\_99\_17)  
 I\_1\_99\_17 993 *Salmonella typhi* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC 1\_1\_99\_17)  
 I\_1\_99\_17 395 *Salmonella paratyphi* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC 1\_1\_99\_17)  
 I\_1\_99\_17 396 *Salmonella paratyphi* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC 1\_1\_99\_17)  
 I\_1\_99\_17 3182 *Salmonella paratyphi* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE) PRECURSOR (EC 1\_1\_99\_17)  
 I\_1\_99\_17 3184 *Salmonella paratyphi* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE) PRECURSOR (EC 1\_1\_99\_17)  
 I\_1\_99\_17 522 *Salmonella enteritidis* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC 1\_1\_99\_17)



I\_1\_99\_17 1946 *Salmonella enteritidis* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE)  
 PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 450 *Salmonella dublin* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE)  
 PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 1468 *Salmonella dublin* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE) (EC  
 I\_1\_99\_17)  
 I\_1\_99\_17 1258 *Pseudomonas aeruginosa* PA1112 GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-  
 QUINONE) PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 6088 *Pseudomonas aeruginosa* gcd GLUCOSE DEHYDROGENASE-A [PYRROLOQUINOLINE-  
 QUINONE] PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 4135 *Klebsiella pneumoniae* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE)  
 (EC I\_1\_99\_17)  
 I\_1\_99\_17 4136 *Klebsiella pneumoniae* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE)  
 (EC I\_1\_99\_17)  
 I\_1\_99\_17 4138 *Klebsiella pneumoniae* GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE)  
 (EC I\_1\_99\_17)  
 I\_1\_99\_17 8195 *Klebsiella pneumoniae* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-  
 QUINONE) PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 8196 *Klebsiella pneumoniae* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-  
 QUINONE) PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 804 *Escherichia coli* b0837 GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE)  
 PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 4337 *Escherichia coli* gcd GLUCOSE DEHYDROGENASE (PYRROLOQUINOLINE-QUINONE)  
 (EC I\_1\_99\_17)  
 I\_1\_99\_17 4788 *Escherichia coli* b1144 GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-  
 QUINONE) (EC I\_1\_99\_17)  
 I\_1\_99\_17 3518 *Bordetella pertussis* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE)  
 PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 3519 *Bordetella pertussis* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE)  
 PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_17 4966 *Bordetella bronchiseptica* GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-  
 QUINONE) PRECURSOR (EC I\_1\_99\_17)  
 I\_1\_99\_21 8182 *Pseudomonas aeruginosa* PA4571 sorbitol dehydrogenase, cytochrome c subunit (EC I\_1\_99\_21)  
 I\_1\_99\_25 6023 *Yersinia pseudotuberculosis* BS-yhfK quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 1496 *Yersinia pestis* Q56987 quinate dehydrogenase (pyrroloquinoline-quinone) (EC I\_1\_99\_25)  
 I\_1\_99\_25 7554 *Vibrio cholerae* El Tor N16961ORFA00828 quinate dehydrogenase (pyrroloquinoline-quinone)  
 (EC I\_1\_99\_25)  
 I\_1\_99\_25 1081 *Streptococcus pneumoniae* BS-ywnB quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 930 *Staphylococcus aureus* BS-yhfK quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 5465 *Saccharomyces cerevisiae* YMR090W quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 8532 *Pseudomonas aeruginosa* PA0741 quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 2947 *Enterococcus faecium* (DOE) quinate dehydrogenase (pyrroloquinoline-quinone) (EC I\_1\_99\_25)  
 I\_1\_99\_25 4055 *Enterococcus faecium* (DOE) BS-yhfK quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 2339 *Enterococcus faecalis* BS-ywnB quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 2040 *Campylobacter jejuni* Cj1555c quinate dehydrogenase (pyrroloquinoline-quinone) (EC  
 I\_1\_99\_25)  
 I\_1\_99\_25 1026 *Bacillus subtilis* yhfK quinate dehydrogenase (pyrroloquinoline-quinone) (EC I\_1\_99\_25)  
 I\_1\_99\_25 3657 *Bacillus subtilis* ywnB quinate dehydrogenase (pyrroloquinoline-quinone) (EC I\_1\_99\_25)  
 I\_1\_99\_28 3781 *Yersinia pestis* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC I\_1\_99\_28)  
 I\_1\_99\_28 979 *Streptococcus pneumoniae* EC-yjhC GLUCOSE--FRUCTOSE OXIDOREDUCTASE  
 PRECURSOR (EC I\_1\_99\_28)  
 I\_1\_99\_28 2014 *Staphylococcus aureus* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC  
 I\_1\_99\_28)  
 I\_1\_99\_28 3769 *Staphylococcus aureus* BS-yrbE GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR  
 (EC I\_1\_99\_28)

I\_1\_99\_28 2360 *Salmonella typhimurium* yjhc GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 5269 *Salmonella paratyphi* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 816 *Salmonella enteritidis* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 3620 *Salmonella dublin* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 795 *Pasteurella multocida* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 5501 *Klebsiella pneumoniae* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 1275 *Escherichia coli* b1315 GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 180 *Bordetella pertussis* EC-yjhc GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_28 78 *Bordetella bronchiseptica* EC-yjhc GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 I\_1\_99\_3 2248 *Pseudomonas aeruginosa* PA2266 gluconate 2-dehydrogenase, cytochrome c subunit (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2588 *Pseudomonas aeruginosa* PA2265 gluconate 2-dehydrogenase alpha chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2591 *Pseudomonas aeruginosa* PA2264 gluconate 2-dehydrogenase gamma chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2963 *Klebsiella pneumoniae* gluconate 2-dehydrogenase beta chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2964 *Klebsiella pneumoniae* gluconate 2-dehydrogenase beta chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2965 *Klebsiella pneumoniae* gluconate 2-dehydrogenase alpha chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2967 *Klebsiella pneumoniae* gluconate 2-dehydrogenase gamma chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2440 *Campylobacter jejuni* Cj0414 gluconate 2-dehydrogenase gamma chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 2441 *Campylobacter jejuni* Cj0415 gluconate 2-dehydrogenase alpha chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 8450 *Bordetella bronchiseptica* gluconate 2-dehydrogenase beta chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 8903 *Bordetella bronchiseptica* gluconate 2-dehydrogenase gamma chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_3 8904 *Bordetella bronchiseptica* gluconate 2-dehydrogenase alpha chain precursor (EC 1\_1\_99\_3)  
 I\_1\_99\_8 5086 *Pseudomonas aeruginosa* exaA ALCOHOL DEHYDROGENASE [ACCEPTOR] PRECURSOR (EC 1\_1\_99\_8)  
 I\_1\_99\_8 6922 *Klebsiella pneumoniae* METHANOL DEHYDROGENASE SUBUNIT I PRECURSOR (EC 1\_1\_99\_8)  
 I\_1\_99\_8 6923 *Klebsiella pneumoniae* METHANOL DEHYDROGENASE SUBUNIT I PRECURSOR (EC 1\_1\_99\_8)  
 I\_1\_99\_8 6924 *Klebsiella pneumoniae* METHANOL DEHYDROGENASE SUBUNIT I PRECURSOR (EC 1\_1\_99\_8)  
 I\_10\_3\_2 5230 *Yersinia pseudotuberculosis* EC-yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 1804 *Yersinia pestis* EC-yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4423 *Salmonella typhimurium* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4424 *Salmonella typhimurium* yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 992 *Salmonella typhi* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3036 *Salmonella paratyphi* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3038 *Salmonella paratyphi* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3039 *Salmonella paratyphi* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3748 *Salmonella enteritidis* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3655 *Salmonella dublin* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 422 *Pasteurella multocida* EC-yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 179 *Neurospora crassa* AAA33590\_1 LACCASE PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 180 *Neurospora crassa* AAA33591\_1 LACCASE PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 181 *Neurospora crassa* AAA33592\_1 LACCASE PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 3025 *Mycobacterium tuberculosis* Rv0846c LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 941 *Mycobacterium bovis* EC-yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4130 *Klebsiella pneumoniae* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4131 *Klebsiella pneumoniae* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4132 *Klebsiella pneumoniae* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 4133 *Klebsiella pneumoniae* LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 123 *Escherichia coli* yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_3\_2 1893 *Corynebacterium diphtheriae* LACCASE I PRECURSOR (EC 1\_10\_3\_2)

I\_10\_3\_2 1983 *Campylobacter jejuni* Cj1516 LACCASE 1 PRECURSOR (EC 1\_10\_3\_2)  
 I\_10\_99\_1 264 *Rickettsia prowazekii* RP270 CYTOCHROME B6-F COMPLEX IRON-SULFUR SUBUNIT (EC 1\_10\_99\_1)  
 I\_11\_1\_1 1506 *Streptococcus pyogenes* NADH PEROXIDASE (EC 1\_11\_1\_1)  
 I\_11\_1\_1 2817 *Enterococcus faecium* (DOE) NADH PEROXIDASE (EC 1\_11\_1\_1)  
 I\_11\_1\_1 1676 *Enterococcus faecalis* NADH PEROXIDASE (EC 1\_11\_1\_1)  
 I\_11\_1\_10 5676 *Salmonella typhimurium* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 1987 *Salmonella enteritidis* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 4704 *Salmonella dublin* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 6032 *Pseudomonas aeruginosa* cpo NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 3762 *Mycobacterium tuberculosis* hpx NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 4722 *Mycobacterium tuberculosis* Rv3312c NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 1949 *Mycobacterium bovis* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 3985 *Mycobacterium bovis* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 3986 *Mycobacterium bovis* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 5990 *Klebsiella pneumoniae* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 1545 *Clostridium difficile* BS-yisY NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 1045 *Clostridium acetobutylicum* 19696077\_C3\_52 NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_10 1090 *Bacillus subtilis* yisY NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 I\_11\_1\_5 5289 *Yersinia pseudotuberculosis* EC-yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 2698 *Yersinia pestis* EC-yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 3973 *Vibrio cholerae* El Tor N16961 ORF00136 CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 5858 *Salmonella typhimurium* yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 911 *Salmonella typhi* CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 2571 *Salmonella paratyphi* CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 1073 *Salmonella enteritidis* CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 6529 *Saccharomyces cerevisiae* CCP1 CYTOCHROME C PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 1122 *Pseudomonas aeruginosa* ccpR CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 37 *Pasteurella multocida* EC-yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 888 *Neisseria gonorrhoeae* PROBABLE CYTOCHROME C PEROXIDASE (EC 1\_11\_1\_5)  
 I\_11\_1\_5 842 *Helicobacter pylori* HP1461 CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 1341 *Helicobacter pylori* J99tr|Q9ZJF8 CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 6054 *Escherichia coli* yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 2341 *Campylobacter jejuni* Cj0358 CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_11\_1\_5 2725 *Campylobacter jejuni* Cj0020c CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 I\_12\_1\_2 12 *Clostridium difficile* NAD-REDUCING HYDROGENASE HOXS ALPHA SUBUNIT (EC 1\_12\_1\_2)  
 I\_12\_99\_1 1065 *Clostridium difficile* COENZYME F420 HYDROGENASE BETA SUBUNIT (EC 1\_12\_99\_1)  
 I\_12\_99\_3 65 *Helicobacter pylori* HP0631 QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN PRECURSOR (EC 1\_12\_99\_3)  
 I\_12\_99\_3 575 *Helicobacter pylori* J99tr|Q9ZLK5 QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN PRECURSOR (EC 1\_12\_99\_3)  
 I\_12\_99\_3 1345 *Clostridium acetobutylicum* 33401551\_F3\_23 QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN (EC 1\_12\_99\_3)  
 I\_12\_99\_3 647 *Campylobacter jejuni* hydA2 QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN PRECURSOR (EC 1\_12\_99\_3)  
 I\_12\_99\_3 2923 *Campylobacter jejuni* hydA QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN PRECURSOR (EC 1\_12\_99\_3)  
 I\_13\_11\_1 257 *Pseudomonas aeruginosa* catA CATECHOL 1,2-DIOXYGENASE (EC 1\_13\_11\_1)  
 I\_13\_11\_2 5927 *Pseudomonas aeruginosa* PA3503 METAPYROCATECHASE (EC 1\_13\_11\_2)  
 I\_13\_11\_2 685 *Klebsiella pneumoniae* METAPYROCATECHASE (EC 1\_13\_11\_2)  
 I\_13\_11\_3 387 *Rickettsia prowazekii* RP396 PROTOCATECHUATE 3,4-DIOXYGENASE BETA CHAIN (EC 1\_13\_11\_3)

I\_13\_11\_3 6877 *Pseudomonas aeruginosa* pcaH PROTOCATECHUATE 3,4-DIOXYGENASE BETA CHAIN (EC I\_13\_11\_3)  
 I\_13\_11\_3 6878 *Pseudomonas aeruginosa* pcaG PROTOCATECHUATE 3,4-DIOXYGENASE ALPHA CHAIN (EC I\_13\_11\_3)  
 I\_13\_11\_3 6919 *Klebsiella pneumoniae* PROTOCATECHUATE 3,4-DIOXYGENASE BETA CHAIN (EC I\_13\_11\_3)  
 I\_13\_11\_3 6920 *Klebsiella pneumoniae* PROTOCATECHUATE 3,4-DIOXYGENASE ALPHA CHAIN (EC I\_13\_11\_3)  
 I\_13\_11\_4 3418 *Salmonella typhimurium* GENTISATE 1,2-DIOXYGENASE (EC I\_13\_11\_4)  
 I\_13\_11\_4 436 *Salmonella typhi* GENTISATE 1,2-DIOXYGENASE (EC I\_13\_11\_4)  
 I\_13\_11\_4 1960 *Salmonella paratyphi* GENTISATE 1,2-DIOXYGENASE (EC I\_13\_11\_4)  
 I\_13\_11\_4 3462 *Salmonella enteritidis* GENTISATE 1,2-DIOXYGENASE (EC I\_13\_11\_4)  
 I\_13\_11\_4 916 *Pseudomonas aeruginosa* gtdA GENTISATE 1,2-DIOXYGENASE (EC I\_13\_11\_4)  
 I\_13\_11\_8 1438 *Klebsiella pneumoniae* PROTOCATECHUATE 4,5-DIOXYGENASE BETA CHAIN (EC I\_13\_11\_8)  
 I\_13\_11\_8 1439 *Klebsiella pneumoniae* PROTOCATECHUATE 4,5-DIOXYGENASE BETA CHAIN (EC I\_13\_11\_8)  
 I\_14\_12\_1 2526 *Pseudomonas aeruginosa* antA ANTHRANILATE DIOXYGENASE LARGE SUBUNIT (EC I\_14\_12\_1)  
 I\_14\_12\_1 6488 *Pseudomonas aeruginosa* antB ANTHRANILATE DIOXYGENASE SMALL SUBUNIT (EC I\_14\_12\_1)  
 I\_14\_12\_3 3775 *Mycobacterium tuberculosis* Rv3161c BENZENE 1,2-DIOXYGENASE ALPHA SUBUNIT (EC I\_14\_12\_3)  
 I\_14\_12\_3 1958 *Mycobacterium bovis* BENZENE 1,2-DIOXYGENASE ALPHA SUBUNIT (EC I\_14\_12\_3)  
 I\_14\_13\_1 3165 *Staphylococcus aureus* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 1957 *Salmonella paratyphi* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 2306 *Pseudomonas aeruginosa* PA4217 SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 7547 *Pseudomonas aeruginosa* PA2587 SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 4797 *Mycobacterium tuberculosis* Rv0575c SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 5663 *Mycobacterium tuberculosis* Rv1260 SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 3080 *Mycobacterium bovis* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 3081 *Mycobacterium bovis* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 3614 *Mycobacterium bovis* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 3886 *Klebsiella pneumoniae* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 3887 *Klebsiella pneumoniae* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 4410 *Bordetella pertussis* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 4411 *Bordetella pertussis* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 7955 *Bordetella bronchiseptica* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 8124 *Bordetella bronchiseptica* SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_1 723 *Bacillus subtilis* yetM SALICYLATE HYDROXYLASE (EC I\_14\_13\_1)  
 I\_14\_13\_2 1552 *Pseudomonas aeruginosa* pobA P-HYDROXYBENZOATE HYDROXYLASE (EC I\_14\_13\_2)  
 I\_14\_13\_2 4875 *Klebsiella pneumoniae* P-HYDROXYBENZOATE HYDROXYLASE (EC I\_14\_13\_2)  
 I\_14\_13\_2 4876 *Klebsiella pneumoniae* P-HYDROXYBENZOATE HYDROXYLASE (EC I\_14\_13\_2)  
 I\_14\_13\_3 4819 *Yersinia pseudotuberculosis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 5410 *Yersinia pseudotuberculosis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 1254 *Yersinia pestis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 1255 *Yersinia pestis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 4940 *Salmonella typhimurium* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 2180 *Salmonella typhi* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 5849 *Salmonella paratyphi* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 5850 *Salmonella paratyphi* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 4223 *Salmonella enteritidis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 3550 *Salmonella dublin* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 799 *Pseudomonas aeruginosa* hpaA 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)

I\_14\_13\_3 922 *Pasteurella multocida* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 954 *Neisseria gonorrhoeae* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 4764 *Mycobacterium tuberculosis* Rv3007c 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 2352 *Klebsiella pneumoniae* 4-hydroxyphenylacetate 3-monooxygenase (EC I\_14\_13\_3)  
 I\_14\_13\_3 4948 *Klebsiella pneumoniae* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 4949 *Klebsiella pneumoniae* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 374 *Haemophilus ducreyi* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 4727 *Escherichia coli* b1007 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_3 1860 *Bacillus subtilis* yoaI 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE (EC I\_14\_13\_3)  
 I\_14\_13\_7 3305 *Clostridium difficile* PHENOL HYDROXYLASE P5 PROTEIN (EC I\_14\_13\_7)  
 I\_14\_13\_7 3759 *Bordetella pertussis* PHENOL HYDROXYLASE P5 PROTEIN (EC I\_14\_13\_7)  
 I\_14\_13\_7 8286 *Bordetella bronchiseptica* PHENOL HYDROXYLASE P5 PROTEIN (EC I\_14\_13\_7)  
 I\_14\_14\_3 7523 *Yersinia pseudotuberculosis* EC-yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 754 *Yersinia pestis* EC-yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 4913 *Yersinia pestis* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1282 *Streptococcus pyogenes* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 238 *Streptococcus pneumoniae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1005 *Staphylococcus aureus* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1761 *Staphylococcus aureus* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 2335 *Staphylococcus aureus* BS-yddN ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 3252 *Salmonella typhimurium* yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 6246 *Salmonella typhimurium* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 3141 *Salmonella typhi* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 4093 *Salmonella typhi* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 51 *Salmonella paratyphi* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 52 *Salmonella paratyphi* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 348 *Salmonella paratyphi* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 3770 *Salmonella paratyphi* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1304 *Salmonella enteritidis* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 2903 *Salmonella enteritidis* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1120 *Salmonella dublin* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1573 *Salmonella dublin* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 2229 *Pseudomonas aeruginosa* PA2483 ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 7385 *Pseudomonas aeruginosa* PA5306 ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 7839 *Pseudomonas aeruginosa* PA1186 ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1366 *Mycobacterium tuberculosis* Rv1936 ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 2968 *Mycobacterium tuberculosis* Rv3618 ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 4511 *Mycobacterium tuberculosis* Rv3520c ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 2832 *Mycobacterium leprae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1268 *Mycobacterium bovis* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1770 *Mycobacterium bovis* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 1146 *Klebsiella pneumoniae* ALKANAL MONOOXYGENASE BETA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 3937 *Klebsiella pneumoniae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 4344 *Klebsiella pneumoniae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)  
 I\_14\_14\_3 4345 *Klebsiella pneumoniae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC I\_14\_14\_3)

I\_14\_14\_3 4347 *Klebsiella pneumoniae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 1342 *Escherichia coli* b1382 ALKANAL MONOOXYGENASE BETA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 3084 *Escherichia coli* yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 697 *Enterococcus faecium* (DOE) ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 738 *Enterococcus faecalis* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 4 *Corynebacterium diphtheriae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 1373 *Corynebacterium diphtheriae* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 6345 *Bordetella bronchiseptica* EC-yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 7800 *Bordetella bronchiseptica* ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 289 *Bacillus subtilis* yceB ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 504 *Bacillus subtilis* yddN ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 2927 *Bacillus subtilis* ytmO ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 3393 *Bacillus subtilis* yvbT ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_14\_3 3803 *Bacillus subtilis* ywcH ALKANAL MONOOXYGENASE ALPHA CHAIN (EC 1\_14\_14\_3)  
 I\_14\_99\_6 2999 *Mycobacterium tuberculosis* desA1 ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_14\_99\_6 4259 *Mycobacterium tuberculosis* desA2 ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_14\_99\_6 1516 *Mycobacterium lepraetr*Q50050 ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_14\_99\_6 2009 *Mycobacterium lepraetr*Q9X793 ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_14\_99\_6 1889 *Mycobacterium bovis* ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_14\_99\_6 2441 *Mycobacterium bovis* ACYL-[ACYL-CARRIER PROTEIN] DESATURASE PRECURSOR (EC 1\_14\_99\_6)  
 I\_16\_1\_1 480 *Streptococcus pneumoniae* EC-ykgC MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 1949 *Salmonella typhimurium* ykgC MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 2126 *Salmonella typhi* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 3617 *Salmonella typhi* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 4008 *Salmonella typhi* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 1894 *Salmonella paratyphi* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 3425 *Salmonella enteritidis* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 4549 *Salmonella dublin* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 5581 *Mycobacterium tuberculosis* lpdB MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 3743 *Mycobacterium bovis* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 8520 *Klebsiella pneumoniae* MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 4421 *Escherichia coli* ykgC MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_16\_1\_1 3836 *Enterococcus faecium* (DOE) EC-ykgC MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 I\_2\_1\_10 5050 *Yersinia pestis* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 5828 *Vibrio cholerae* El Tor N16961 ORF02567 ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 1475 *Streptococcus pyogenes* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 1237 *Streptococcus pneumoniae* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 161 *Streptococcus mutans* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 764 *Streptococcus equi* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 1750 *Staphylococcus aureus* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 I\_2\_1\_10 1858 *Salmonella typhimurium* ana ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE

1\_2\_1\_10 301 *Salmonella typhi* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 659 *Salmonella paratyphi* ALDEHYDE-ALCOHOL DEHYDROGENASE [INCLUDES: ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) (ADH) ; ACETALDEHYDE DEHYDROGENASE [ACETYLATED] (EC 1\_2\_1\_10) (ACDH) ; PYRUVATE-FORMATE-LYASE DEACTIVASE (PFL DEACTIVASE) ]  
 1\_2\_1\_10 660 *Salmonella paratyphi* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 3754 *Salmonella enteritidis* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 1361 *Salmonella dublin* ALDEHYDE-ALCOHOL DEHYDROGENASE [INCLUDES: ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) (ADH) ; ACETALDEHYDE DEHYDROGENASE [ACETYLATED] (EC 1\_2\_1\_10) (ACDH) ; PYRUVATE-FORMATE-LYASE DEACTIVASE (PFL DEACTIVASE) ]  
 1\_2\_1\_10 2008 *Pasteurella multocida adh2* ALCOHOL DEHYDROGENASE 2 (EC 1\_1\_1\_1) / ALACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 1016 *Mycobacterium tuberculosis* Rv3535c ACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 554 *Mycobacterium bovis* ACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 687 *Klebsiella pneumoniae* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 1719 *Klebsiella pneumoniae* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 1967 *Klebsiella pneumoniae* ACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 1968 *Klebsiella pneumoniae* ACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 335 *Escherichia coli mhpE* ACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 4830 *Escherichia coli adhE* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 3540 *Enterococcus faecium* (DOE) ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 1414 *Enterococcus faecalis* ALCOHOL DEHYDROGENASE 2 (EC 1\_1\_1\_1) / ALACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 2929 *Enterococcus faecalis* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 2959 *Enterococcus faecalis* ALCOHOL DEHYDROGENASE 2 (EC 1\_1\_1\_1) / ALACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 103 *Clostridium difficile* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 669 *Clostridium difficile* ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 2075 *Clostridium difficile* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 2086 *Clostridium difficile* ALCOHOL DEHYDROGENASE 2 (EC 1\_1\_1\_1) / ALACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_10)  
 1\_2\_1\_10 409 *Clostridium acetobutylicum* 13726577\_C1\_68 ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 671 *Clostridium acetobutylicum* 24098812\_F1\_7 ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1) / ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10) / PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_10 3099 *Bacillus subtilis* gbsB ACETALDEHYDE DEHYDROGENASE (ACETYLATED) (EC 1\_2\_1\_10)  
 1\_2\_1\_11 4156 *Yersinia pseudotuberculosis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 6981 *Yersinia pseudotuberculosis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 724 *Yersinia pestis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1584 *Yersinia pestis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 734 *Vibrio cholerae* El Tor N16961 ORF02795 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 735 *Vibrio cholerae* El Tor N16961 ORF03067 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)

1\_2\_1\_11 742 *Vibrio cholerae* El Tor N16961 ORF00373 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 743 *Vibrio cholerae* El Tor N16961 ORF01229 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 744 *Vibrio cholerae* El Tor N16961 ORF01217 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 5831 *Vibrio cholerae* El Tor N16961 ORF02571 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 5900 *Vibrio cholerae* El Tor N16961 ORF02658 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1355 *Streptococcus pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1764 *Streptococcus mutans* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1397 *Staphylococcus aureus* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 13 *Salmonella typhimurium* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1297 *Salmonella typhimurium* usg ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 605 *Salmonella typhi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1397 *Salmonella typhi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 2048 *Salmonella paratyphi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 2050 *Salmonella paratyphi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 2051 *Salmonella paratyphi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 4111 *Salmonella paratyphi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 4317 *Salmonella enteritidis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 3969 *Salmonella dublin* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 392 *Saccharomyces cerevisiae* HOM2 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 310 *Rickettsia prowazekii* RP316 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 291 *Pseudomonas aeruginosa* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1566 *Pseudomonas aeruginosa* PA3116 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1141 *Porphyromonas gingivalis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 694 *Pasteurella multocida* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1498 *Pasteurella multocida* usg1 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1823 *Neisseria gonorrhoeae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 4369 *Mycobacterium tuberculosis* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1366 *Mycobacterium leprae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1775 *Mycobacterium leprae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 72 *Mycobacterium bovis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1958 *Klebsiella pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1959 *Klebsiella pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1960 *Klebsiella pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 4661 *Klebsiella pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 8144 *Klebsiella pneumoniae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 588 *Helicobacter pylori* HP1189 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1104 *Helicobacter pylori* J99 asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 11538 *Haemophilus influenzae* HI1433 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 13276 *Haemophilus influenzae* HI0646 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 262 *Haemophilus ducreyi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 828 *Haemophilus ducreyi* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 5413 *Escherichia coli* usg ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 6010 *Escherichia coli* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1807 *Enterococcus faecium* (DOE) ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)



1\_2\_1\_11 2023 *Enterococcus faecalis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 271 *Corynebacterium diphtheriae* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1033 *Clostridium difficile* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 855 *Clostridium acetobutylicum* 34110200\_F1\_1 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 2425 *Clostridium acetobutylicum* 24407827\_F3\_21 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 345 *Chlamydia trachomatis* D/UW-3/Cx asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 804 *Chlamydia pneumoniae* AR39 CP0804 ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 970 *Chlamydia pneumoniae* CWL029 asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1755 *Campylobacter jejuni* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 520 *Bordetella pertussis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 7339 *Bordetella bronchiseptica* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_11 1675 *Bacillus subtilis* asd ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_11)  
 1\_2\_1\_2 6935 *Yersinia pseudotuberculosis* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 7508 *Yersinia pseudotuberculosis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 7509 *Yersinia pseudotuberculosis* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 144 *Yersinia pestis* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 608 *Yersinia pestis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 3417 *Yersinia pestis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4465 *Yersinia pestis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4466 *Yersinia pestis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4594 *Yersinia pestis* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 7683 *Vibrio cholerae* El Tor N16961 FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 1515 *Staphylococcus aureus* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 1546 *Staphylococcus aureus* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2)  
 1\_2\_1\_2 2476 *Salmonella typhimurium* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 3477 *Salmonella typhimurium* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4494 *Salmonella typhimurium* FORMATE DEHYDROGENASE LARGE SUBUNIT PRECURSOR (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4495 *Salmonella typhimurium* fdhF FORMATE DEHYDROGENASE LARGE SUBUNIT PRECURSOR (EC 1\_2\_1\_2)  
 1\_2\_1\_2 6807 *Salmonella typhimurium* fdoG FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 1006 *Salmonella typhi* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 1\_2\_1\_2 3064 *Salmonella typhi* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 1\_2\_1\_2 5456 *Salmonella typhi* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 5457 *Salmonella typhi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 224 *Salmonella paratyphi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 226 *Salmonella paratyphi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 2546 *Salmonella paratyphi* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 2658 *Salmonella paratyphi* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 1\_2\_1\_2 2659 *Salmonella paratyphi* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 1\_2\_1\_2 2660 *Salmonella paratyphi* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 2661 *Salmonella paratyphi* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 1\_2\_1\_2 3952 *Salmonella paratyphi* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)

I\_2\_1\_2 3953 *Salmonella paratyphi* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 3955 *Salmonella paratyphi* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5743 *Salmonella paratyphi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5744 *Salmonella paratyphi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5745 *Salmonella paratyphi* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1779 *Salmonella enteritidis* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 2754 *Salmonella enteritidis* FORMATE DEHYDROGENASE H (EC 1\_2\_1\_2)  
 I\_2\_1\_2 2057 *Salmonella dublin* FORMATE DEHYDROGENASE H (EC 1\_2\_1\_2)  
 I\_2\_1\_2 8300 *Saccharomyces cerevisiae* YPL275W FORMATE DEHYDROGENASE (EC 1\_2\_1\_2)  
 I\_2\_1\_2 7628 *Pseudomonas aeruginosa* PA5181 FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1424 *Pasteurella multocida* fdxG\_1 FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1425 *Pasteurella multocida* fdxG\_2 FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 158 *Neurospora crassa* fdh FORMATE DEHYDROGENASE (EC 1\_2\_1\_2)  
 I\_2\_1\_2 625 *Mycobacterium tuberculosis* fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 656 *Mycobacterium bovis* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1920 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 4394 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6452 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 I\_2\_1\_2 6453 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2), FORMATE-HYDROGEN-LYASE-LINKED, SELENOCYSTEINE-CONTAINING POLYPEPTIDE  
 I\_2\_1\_2 6957 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6959 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6961 *Klebsiella pneumoniae* FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 759 *Haemophilus influenzae* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 7220 *Haemophilus influenzae* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 7221 *Haemophilus influenzae* HI0006 FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1434 *Escherichia coli* fdnG FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 4951 *Escherichia coli* b1501 FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6611 *Escherichia coli* fdoG FORMATE DEHYDROGENASE-O, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6636 *Escherichia coli* fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6737 *Escherichia coli* FORMATE DEHYDROGENASE, NITRATE-INDUCIBLE, MAJOR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 2623 *Enterococcus faecalis* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1379 *Clostridium difficile* BS-yyaE FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 2875 *Clostridium difficile* BS-yoaE FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 3437 *Clostridium difficile* FORMATE DEHYDROGENASE LARGE SUBUNIT PRECURSOR (EC 1\_2\_1\_2)  
 I\_2\_1\_2 3438 *Clostridium difficile* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 1975 *Campylobacter jejuni* fdhB FORMATE DEHYDROGENASE IRON-SULFUR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 2965 *Campylobacter jejuni* fdhA FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 509 *Bordetella pertussis* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 510 *Bordetella pertussis* FORMATE DEHYDROGENASE IRON-SULFUR SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 3657 *Bordetella pertussis* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2)  
 I\_2\_1\_2 4261 *Bordetella pertussis* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5447 *Bordetella bronchiseptica* FORMATE DEHYDROGENASE BETA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5732 *Bordetella bronchiseptica* NAD-DEPENDENT FORMATE DEHYDROGENASE BETA SUBUNIT (EC 1\_2\_1\_2)  
 I\_2\_1\_2 5988 *Bordetella bronchiseptica* FORMATE DEHYDROGENASE (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6035 *Bordetella bronchiseptica* FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 I\_2\_1\_2 6122 *Bordetella bronchiseptica* NAD-DEPENDENT FORMATE DEHYDROGENASE ALPHA SUBUNIT (EC 1\_2\_1\_2)

1\_2\_1\_2 6889 *Bordetella bronchiseptica* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 8477 *Bordetella bronchiseptica* FORMATE DEHYDROGENASE IRON-SULFUR SUBUNIT (EC 1\_2\_1\_2)  
 1\_2\_1\_2 1217 *Bacillus subtilis* yjgC FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 1856 *Bacillus subtilis* yoaE FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 2715 *Bacillus subtilis* yrhE FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_2 4087 *Bacillus subtilis* yyaE FORMATE DEHYDROGENASE ALPHA CHAIN (EC 1\_2\_1\_2)  
 1\_2\_1\_22 5616 *Vibrio cholerae* El Tor N16961 ORF02302 ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3842 *Staphylococcus aureus* EC-aldB ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 5970 *Salmonella typhimurium* aldB ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 4569 *Salmonella typhi* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 2115 *Salmonella paratyphi* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3152 *Salmonella enteritidis* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 4528 *Salmonella enteritidis* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3174 *Salmonella dublin* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 5926 *Pseudomonas aeruginosa* PA3504 ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 594 *Neisseria gonorrhoeae* EC-aldA ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3631 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3632 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 3633 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 6838 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 6840 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 6841 *Klebsiella pneumoniae* ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 1375 *Escherichia coli* aldA ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 6090 *Escherichia coli* aldB ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 1623 *Enterococcus faecalis* EC-aldB ALDEHYDE DEHYDROGENASE B (EC 1\_2\_1\_22)  
 1\_2\_1\_22 2796 *Campylobacter jejuni* ald' ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_22 2797 *Campylobacter jejuni* ald' ALDEHYDE DEHYDROGENASE A (EC 1\_2\_1\_22)  
 1\_2\_1\_38 7307 *Yersinia pseudotuberculosis* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 1385 *Yersinia pestis* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 6393 *Vibrio cholerae* El Tor N16961 ORF03343 N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 1942 *Streptococcus mutans* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 2317 *Staphylococcus aureus* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 5228 *Salmonella typhimurium* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 1721 *Salmonella typhi* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 2417 *Salmonella paratyphi* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 2418 *Salmonella paratyphi* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 3602 *Salmonella enteritidis* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 986 *Salmonella dublin* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 4070 *Saccharomyces cerevisiae* ARG5,6 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8) / N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 8053 *Pseudomonas aeruginosa* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 550 *Pasteurella multocida* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 236 *Neurospora crassa* arg-6 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8) / N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 677 *Neisseria gonorrhoeae* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)

1\_2\_1\_38 1428 *Mycobacterium tuberculosis* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 21 *Mycobacterium leprae* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_38 3093 *Mycobacterium leprae* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 1852 *Mycobacterium bovis* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE  
 (EC 1\_2\_1\_38)  
 1\_2\_1\_38 7474 *Klebsiella pneumoniae* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_38 7475 *Klebsiella pneumoniae* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_38 297 *Haemophilus ducreyi* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_38 3856 *Escherichia coli* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_38 1490 *Corynebacterium diphtheriae* N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE  
 (EC 1\_2\_1\_38)  
 1\_2\_1\_38 477 *Clostridium difficile* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE  
 (EC 1\_2\_1\_38)  
 1\_2\_1\_38 901 *Clostridium acetobutylicum* 5110625\_F3\_42 N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 902 *Clostridium acetobutylicum* 6907642\_F3\_43 N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 2148 *Campylobacter jejuni* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE  
 (EC 1\_2\_1\_38)  
 1\_2\_1\_38 2184 *Bordetella pertussis* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE  
 (EC 1\_2\_1\_38)  
 1\_2\_1\_38 7446 *Bordetella bronchiseptica* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_38 1120 *Bacillus subtilis* argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC  
 1\_2\_1\_38)  
 1\_2\_1\_39 8343 *Pseudomonas aeruginosa* PA4073 PHENYLACETALDEHYDE DEHYDROGENASE (EC  
 1\_2\_1\_39)  
 1\_2\_1\_39 2131 *Klebsiella pneumoniae* PHENYLACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_39)  
 1\_2\_1\_39 1345 *Escherichia coli* b1385 PHENYLACETALDEHYDE DEHYDROGENASE (EC 1\_2\_1\_39)  
 1\_2\_1\_46 8076 *Pseudomonas aeruginosa* fdhA GLUTATHIONE-INDEPENDENT FORMALDEHYDE  
 DEHYDROGENASE (EC 1\_2\_1\_46)  
 1\_2\_1\_46 4019 *Bacillus subtilis* yycR GLUTATHIONE-INDEPENDENT FORMALDEHYDE  
 DEHYDROGENASE (EC 1\_2\_1\_46)  
 1\_2\_1\_9 502 *Ureaplasma urealyticum* UU362 NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 1730 *Streptococcus pyogenes* gapN NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 1611 *Streptococcus pneumoniae* EC-gabD NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 87 *Streptococcus mutans* NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 2014 *Streptococcus equi* NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 5631 *Pseudomonas aeruginosa* PA2323 NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 3636 *Clostridium difficile* NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_1\_9 1187 *Clostridium acetobutylicum* 2775375\_F2\_12 NADP-DEPENDENT GLYCERALDEHYDE-3-  
 PHOSPHATE DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_2\_2 6213 *Yersinia pseudotuberculosis* EC-poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC  
 1\_2\_2\_2)  
 1\_2\_2\_2 2144 *Yersinia pestis* EC-poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 1\_2\_2\_2 2247 *Staphylococcus aureus* EC-poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC  
 1\_2\_2\_2)

I\_2\_2\_2 3400 *Salmonella typhimurium* poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 1666 *Salmonella typhi* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 6439 *Salmonella paratyphi* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 6440 *Salmonella paratyphi* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 4201 *Salmonella enteritidis* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 3280 *Salmonella dublin* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 2562 *Pseudomonas aeruginosa* poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 4366 *Pseudomonas aeruginosa* PA2108 PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 1518 *Klebsiella pneumoniae* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 1519 *Klebsiella pneumoniae* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 4671 *Escherichia coli* poxB PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 1650 *Corynebacterium diphtheriae* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 7374 *Bordetella bronchiseptica* PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_2 434 *Bacillus subtilis* ydaP PYRUVATE DEHYDROGENASE (CYTOCHROME) (EC 1\_2\_2\_2)  
 I\_2\_2\_4 3880 *Mycobacterium tuberculosis* Rv0375c CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561], MEDIUM CHAIN (EC 1\_2\_2\_4)  
 I\_2\_2\_4 3881 *Mycobacterium tuberculosis* Rv0374c CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561] (EC 1\_2\_2\_4), MOLYBDENUM-CONTAINING IRON-SULFUR FLAVOPROTEIN  
 I\_2\_2\_4 1254 *Mycobacterium bovis* BS-yurB CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561] (EC 1\_2\_2\_4), MOLYBDENUM-CONTAINING IRON-SULFUR FLAVOPROTEIN  
 I\_2\_2\_4 3026 *Mycobacterium bovis* CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561], MEDIUM CHAIN (EC 1\_2\_2\_4)  
 I\_2\_2\_4 2791 *Escherichia coli* b2867 CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561], MEDIUM CHAIN (EC 1\_2\_2\_4)  
 I\_2\_2\_4 2792 *Escherichia coli* b2868 CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561] (EC 1\_2\_2\_4), MOLYBDENUM-CONTAINING IRON-SULFUR FLAVOPROTEIN  
 I\_2\_2\_4 3305 *Bordetella pertussis* BS-yurB CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561] (EC 1\_2\_2\_4), MOLYBDENUM-CONTAINING IRON-SULFUR FLAVOPROTEIN  
 I\_2\_2\_4 6712 *Bordetella bronchiseptica* CARBON MONOXIDE OXYGENASE [CYTOCHROME B-561], MEDIUM CHAIN (EC 1\_2\_2\_4)  
 I\_2\_3\_3 904 *Streptococcus pneumoniae* EC-poxB PYRUVATE OXIDASE (EC 1\_2\_3\_3)  
 I\_2\_7\_1 1920 *Staphylococcus aureus* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1921 *Staphylococcus aureus* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1008 *Porphyromonas gingivalis* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1009 *Porphyromonas gingivalis* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1010 *Porphyromonas gingivalis* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1051 *Porphyromonas gingivalis* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 1052 *Porphyromonas gingivalis* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 3085 *Mycobacterium tuberculosis* Rv2454c PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 3087 *Mycobacterium tuberculosis* Rv2455c PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2772 *Mycobacterium leprae* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2773 *Mycobacterium leprae* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2775 *Mycobacterium leprae* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2776 *Mycobacterium leprae* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2777 *Mycobacterium leprae* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 2290 *Mycobacterium bovis* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 3488 *Mycobacterium bovis* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 26 *Helicobacter pylori* HP0589 PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 27 *Helicobacter pylori* HP0590 PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 28 *Helicobacter pylori* HP0591 PYRUVATE SYNTHASE SUBUNIT PORC (EC 1\_2\_7\_1)  
 I\_2\_7\_1 509 *Helicobacter pylori* HP1108 PORC SUBUNIT OF PYRUVATE:FLAVODOXIN OXIDOREDUCTASE (EC 1\_2\_7\_1)  
 I\_2\_7\_1 510 *Helicobacter pylori* HP1109 PYRUVATE SYNTHASE DELTA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 511 *Helicobacter pylori* HP1110 PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 512 *Helicobacter pylori* HP1111 PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 539 *Helicobacter pylori* J99tr|Q9ZLP1 PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 I\_2\_7\_1 540 *Helicobacter pylori* J99tr|Q9ZLP0 PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 I\_2\_7\_1 541 *Helicobacter pylori* J99tr|Q9ZLN9 PYRUVATE SYNTHASE SUBUNIT PORC (EC 1\_2\_7\_1)

1\_2\_7\_1 1025 *Helicobacter pylori* J99 porG PORC SUBUNIT OF PYRUVATE:FLAVODOXIN  
 OXIDOREDUCTASE (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1026 *Helicobacter pylori* J99 porD PYRUVATE SYNTHASE DELTA CHAIN (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1027 *Helicobacter pylori* J99trQ9ZKA4 PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1028 *Helicobacter pylori* J99trQ9ZKA3 PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1621 *Clostridium difficile* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 3117 *Clostridium difficile* PYRUVATE SYNTHASE SUBUNIT PORC (EC 1\_2\_7\_1)  
 1\_2\_7\_1 3118 *Clostridium difficile* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 3561 *Clostridium difficile* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 3562 *Clostridium difficile* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 3563 *Clostridium difficile* PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 1\_2\_7\_1 2824 *Clostridium acetobutylicum* 34433467\_C2\_18 PYRUVATE SYNTHASE SUBUNIT PORB (EC  
 1\_2\_7\_1)  
 1\_2\_7\_1 2825 *Clostridium acetobutylicum* 4730443\_C1\_15 PYRUVATE SYNTHASE ALPHA CHAIN (EC  
 1\_2\_7\_1)  
 1\_2\_7\_1 1479 *Campylobacter jejuni* oorC PYRUVATE SYNTHASE SUBUNIT PORC (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1480 *Campylobacter jejuni* oorB PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_7\_1 1482 *Campylobacter jejuni* oorA PYRUVATE SYNTHASE ALPHA CHAIN (EC 1\_2\_7\_1)  
 1\_2\_99\_2 3882 *Mycobacterium tuberculosis* Rv0373c CARBON MONOXIDE DEHYDROGENASE ALPHA  
 SUBUNIT (EC 1\_2\_99\_2)  
 1\_2\_99\_2 1253 *Mycobacterium bovis* BS-yurC CARBON MONOXIDE DEHYDROGENASE ALPHA SUBUNIT  
 (EC 1\_2\_99\_2)  
 1\_2\_99\_2 1606 *Clostridium difficile* CARBON MONOXIDE DEHYDROGENASE BETA SUBUNIT (EC  
 1\_2\_99\_2)  
 1\_2\_99\_2 3291 *Clostridium difficile* CARBON MONOXIDE DEHYDROGENASE BETA SUBUNIT (EC  
 1\_2\_99\_2)  
 1\_2\_99\_2 3303 *Clostridium difficile* CARBON MONOXIDE DEHYDROGENASE ALPHA SUBUNIT (EC  
 1\_2\_99\_2)  
 1\_2\_99\_2 1904 *Clostridium acetobutylicum* 553587\_F2\_3 CARBON MONOXIDE DEHYDROGENASE BETA  
 SUBUNIT (EC 1\_2\_99\_2)  
 1\_2\_99\_2 2343 *Clostridium acetobutylicum* 275443\_C2\_7 CARBON MONOXIDE DEHYDROGENASE BETA  
 SUBUNIT (EC 1\_2\_99\_2)  
 1\_2\_99\_2 2645 *Bordetella pertussis* CARBON MONOXIDE DEHYDROGENASE ALPHA SUBUNIT (EC  
 1\_2\_99\_2)  
 1\_2\_99\_3 2737 *Pseudomonas aeruginosa* PA1880 MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_2\_99\_3 8116 *Pseudomonas aeruginosa* PA1601 MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_2\_99\_3 1475 *Bordetella pertussis* MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_2\_99\_3 2726 *Bordetella pertussis* MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_2\_99\_3 2727 *Bordetella pertussis* MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_2\_99\_3 5683 *Bordetella bronchiseptica* MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE), SMALL SUBUNIT (EC 1\_2\_99\_3)  
 1\_2\_99\_3 9767 *Bordetella bronchiseptica* MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_3\_1\_10 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC  
 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38;  
 EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38;  
 EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38;  
 EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC  
 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC  
 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_10 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC  
 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

1\_3\_1\_10 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_12 6916 *Yersinia pseudotuberculosis* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 3648 *Yersinia pestis* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 4554 *Vibrio cholerae* El Tor N16961 ORF00940 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 388 *Streptococcus pneumoniae* EC-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 477 *Streptococcus mutans* BS-tyrA PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2544 *Staphylococcus aureus* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 3907 *Salmonella typhimurium* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 4595 *Salmonella typhi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1603 *Salmonella paratyphi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 739 *Salmonella enteritidis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1797 *Salmonella dublin* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 6949 *Saccharomyces cerevisiae* TYR1 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1599 *Pasteurella multocida* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1360 *Neisseria gonorrhoeae* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 3830 *Mycobacterium tuberculosis* tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 3743 *Mycobacterium leprae* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 4093 *Mycobacterium bovis* EC-tyrA PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 7340 *Klebsiella pneumoniae* PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 772 *Helicobacter pylori* HP1380 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1283 *Helicobacter pylori* J99tr|Q9ZJL2 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 10001 *Haemophilus influenzae* HI1290 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 764 *Haemophilus ducreyi* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 765 *Haemophilus ducreyi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 5568 *Escherichia coli* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2438 *Enterococcus faecium* (DOE) EC-tyrA PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2191 *Enterococcus faecalis* EC-tyrA PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2067 *Corynebacterium diphtheriae* PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2414 *Clostridium difficile* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 1751 *Clostridium acetobutylicum* 33829417\_F1\_5 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 805 *Campylobacter jejuni* tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 194 *Bordetella pertussis* EC-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_12 2257 *Bacillus subtilis* tyrA PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_26 5250 *Yersinia pseudotuberculosis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 2497 *Yersinia pestis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)

1\_3\_1\_26 6158 *Vibrio cholerae* El Tor N16961 ORF03024 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 678 *Streptococcus pneumoniae* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1413 *Streptococcus mutans* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 3163 *Staphylococcus aureus* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 3639 *Salmonella typhimurium* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 6763 *Salmonella typhimurium* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 786 *Salmonella typhi* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1940 *Salmonella paratyphi* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1941 *Salmonella paratyphi* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 3316 *Salmonella enteritidis* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1402 *Salmonella dublin* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 145 *Rickettsia prowazekii* RP148 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1002 *Pseudomonas aeruginosa* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 882 *Porphyromonas gingivalis* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 855 *Pasteurella multocida* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1749 *Neisseria gonorrhoeae* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 4246 *Mycobacterium tuberculosis* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 152 *Mycobacterium leprae* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 531 *Mycobacterium bovis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 121 *Klebsiella pneumoniae* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1430 *Helicobacter pylori* HP0510 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 464 *Helicobacter pylori* J99sp|Q9ZLW6 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 2777 *Haemophilus influenzae* HI1308 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 931 *Haemophilus ducreyi* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 31 *Escherichia coli* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1727 *Enterococcus faecium* (DOE) DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1509 *Enterococcus faecalis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 236 *Corynebacterium diphtheriae* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1035 *Clostridium difficile* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1038 *Clostridium difficile* DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 3321 *Clostridium acetobutylicum* 23461062\_C3\_9 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 346 *Chlamydia trachomatis* D/UW-3/Cx EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 805 *Chlamydia pneumoniae* AR39 CP0805 DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 969 *Chlamydia pneumoniae* CWL029 EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 2122 *Campylobacter jejuni* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 1015 *Bordetella pertussis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 8322 *Bordetella bronchiseptica* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_26 2245 *Bacillus subtilis* dapB DIHYDRODIPICOLINATE REDUCTASE (EC 1\_3\_1\_26)  
 1\_3\_1\_28 5065 *Yersinia pseudotuberculosis* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 870 *Yersinia pestis* BS-yqjQ 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 4629 *Vibrio cholerae* El Tor N16961 ORF01036 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 4812 *Vibrio cholerae* El Tor N16961 ORF01294 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 2961 *Salmonella typhimurium* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 6589 *Salmonella typhimurium* ybbO 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 344 *Salmonella typhi* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 3579 *Salmonella typhi* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 933 *Salmonella paratyphi* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 1233 *Salmonella paratyphi* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)



1\_3\_1\_28 1234 *Salmonella paratyphi* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 993 *Salmonella enteritidis* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 3964 *Salmonella enteritidis* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 2432 *Klebsiella pneumoniae* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 2433 *Klebsiella pneumoniae* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 4367 *Klebsiella pneumoniae* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 306 *Helicobacter pylori* HP0890 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 821 *Helicobacter pylori* J99tr[Q9ZKW1 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 288 *Haemophilus ducreyi* BS-yqjQ 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 577 *Escherichia coli* entA 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 4497 *Escherichia coli* b0493 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_28 3195 *Bacillus subtilis* dhbA 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_31 211 *Clostridium acetobutylicum* 4803135\_F3\_74 2-ENOATE REDUCTASE (EC 1\_3\_1\_31)  
 1\_3\_1\_31 1565 *Clostridium acetobutylicum* 33985077\_F2\_6 2-ENOATE REDUCTASE (EC 1\_3\_1\_31)  
 1\_3\_1\_33 2343 *Mycobacterium tuberculosis* Rv0303 PROTOCHLOROPHYLLIDE REDUCTASE PRECURSOR (EC 1\_3\_1\_33)  
 1\_3\_1\_33 2522 *Mycobacterium bovis* PROTOCHLOROPHYLLIDE REDUCTASE PRECURSOR (EC 1\_3\_1\_33)  
 1\_3\_1\_43 388 *Streptococcus pneumoniae* EC-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 2544 *Staphylococcus aureus* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 1360 *Neisseria gonorrhoeae* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 3830 *Mycobacterium tuberculosis* tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 3743 *Mycobacterium leprae* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 772 *Helicobacter pylori* HP1380 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 1283 *Helicobacter pylori* J99tr[Q9ZJL2 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 2414 *Clostridium difficile* BS-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 1751 *Clostridium acetobutylicum* 33829417\_F1\_5 AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 805 *Campylobacter jejuni* tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_43 194 *Bordetella pertussis* EC-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_54 976 *Salmonella typhimurium* sp[Q05591 PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 2589 *Salmonella typhi* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 6929 *Salmonella paratyphi* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 6930 *Salmonella paratyphi* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 3260 *Salmonella enteritidis* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 3658 *Salmonella dublin* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 5848 *Pseudomonas aeruginosa* PA2909 PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 1223 *Mycobacterium tuberculosis* cobK PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 2417 *Mycobacterium bovis* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 6267 *Klebsiella pneumoniae* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 1523 *Corynebacterium diphtheriae* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)

1\_3\_1\_54 919 *Clostridium difficile* PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_54 2056 *Clostridium acetobutylicum* 5117313\_C2\_27 PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)  
 1\_3\_1\_55 4285 *Pseudomonas aeruginosa* xylL CIS-1,2-DIHYDROXYCYCLOHEXA-3,5-DIENE-1-CARBOXYLATE DEHYDROGENASE (EC 1\_3\_1\_55)  
 1\_3\_1\_55 2793 *Klebsiella pneumoniae* CIS-1,2-DIHYDROXYCYCLOHEXA-3,5-DIENE-1-CARBOXYLATE DEHYDROGENASE (EC 1\_3\_1\_55)  
 1\_3\_1\_6 450 *Streptococcus mutans* fumarate reductase (NADH) (EC 1\_3\_1\_6)  
 1\_3\_1\_6 2120 *Streptococcus mutans* fumarate reductase (NADH) (EC 1\_3\_1\_6)  
 1\_3\_1\_6 5311 *Saccharomyces cerevisiae* YEL047C fumarate reductase (NADH) (EC 1\_3\_1\_6)  
 1\_3\_1\_6 4032 *Enterococcus faecium* (DOE) FUMARATE REDUCTASE [NADH] (EC 1\_3\_1\_6)  
 1\_3\_1\_6 652 *Enterococcus faecalis* FUMARATE REDUCTASE [NADH] (EC 1\_3\_1\_6)  
 1\_3\_1\_9 73 *Streptococcus pyogenes* fabK ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1120 *Streptococcus pneumoniae* ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1452 *Streptococcus mutans* BS-yrpB ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1983 *Streptococcus mutans* ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 141 *Streptococcus equi* ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 2946 *Staphylococcus aureus* EC-fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 368 *Salmonella typhimurium* envM ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1077 *Salmonella typhi* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 2103 *Salmonella paratyphi* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 6145 *Salmonella paratyphi* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 6146 *Salmonella paratyphi* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 2062 *Salmonella enteritidis* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3-HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]  
 1\_3\_1\_9 358 *Rickettsia prowazekii* RP365 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 5261 *Pseudomonas aeruginosa* fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 8528 *Pseudomonas aeruginosa* PA3507 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1371 *Porphyromonas gingivalis* ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 195 *Pasteurella multocida* fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1563 *Neisseria gonorrhoeae* EC-fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 677 *Mycobacterium tuberculosis* inhA ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1725 *Mycobacterium leprae* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1868 *Mycobacterium leprae* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 390 *Mycobacterium bovis* spP46533 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 7719 *Klebsiella pneumoniae* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_1\_9 1146 *Helicobacter pylori* HP0195 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)

I\_3\_1\_9 185 *Helicobacter pylori* J99sp|Q9ZMN7 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 10975 *Haemophilus influenzae* HI1734 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 611 *Haemophilus ducreyi* EC-fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 4856 *Escherichia coli* fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 386 *Enterococcus faecium* (DOE) ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 146 *Enterococcus faecalis* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 1393 *Enterococcus faecalis* EC-fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 3024 *Clostridium difficile* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 62 *Clostridium acetobutylicum*2422837\_C2\_173 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 101 *Chlamydia trachomatis* D/UW-3/Cx fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) PRECURSOR (EC 1\_3\_1\_9)  
 I\_3\_1\_9 349 *Chlamydia pneumoniae* AR39 CP0349 ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) PRECURSOR (EC 1\_3\_1\_9)  
 I\_3\_1\_9 367 *Chlamydia pneumoniae* CWL029 fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) PRECURSOR (EC 1\_3\_1\_9)  
 I\_3\_1\_9 650 *Campylobacter jejuni* fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 17 *Bordetella pertussis* EC-fabI ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 1497 *Bordetella pertussis* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 7993 *Bordetella bronchiseptica* ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 864 *Bacillus subtilis* yfhR ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (fabL) (NADPH) (EC 1\_3\_1\_9)  
 I\_3\_1\_9 1173 *Bacillus subtilis* yjw ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 I\_3\_99\_16 827 *Pseudomonas aeruginosa* PA1602 ISOQUINOLINE 1-OXIDOREDUCTASE ALPHA SUBUNIT (EC 1\_3\_99\_16)  
 I\_3\_99\_4 6227 *Pseudomonas aeruginosa* PA2243 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 888 *Mycobacterium tuberculosis* Rv0785 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 1014 *Mycobacterium tuberculosis* Rv3537 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 552 *Mycobacterium bovis* 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 6753 *Klebsiella pneumoniae* 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 9266 *Klebsiella pneumoniae* 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_3\_99\_4 7927 *Bordetella bronchiseptica* 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 I\_4\_1\_1 5701 *Vibrio cholerae* El Tor N16961 ORF02403 ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 442 *Streptococcus pneumoniae* EC-pntA ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 443 *Streptococcus pneumoniae* ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 894 *Staphylococcus aureus* ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 3169 *Staphylococcus aureus* ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 4240 *Mycobacterium tuberculosis* ald ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 150 *Mycobacterium leprae* ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 525 *Mycobacterium bovis* EC-pntA ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 787 *Helicobacter pylori* HP1398 ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 1416 *Helicobacter pylori* J99 ald ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_1 3186 *Bacillus subtilis* ald ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 I\_4\_1\_13 7734 *Yersinia pseudotuberculosis* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 I\_4\_1\_13 7735 *Yersinia pseudotuberculosis* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 I\_4\_1\_13 3362 *Yersinia pestis* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 I\_4\_1\_13 5109 *Yersinia pestis* EC-yffG GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 I\_4\_1\_13 5155 *Yersinia pestis* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 I\_4\_1\_13 6143 *Vibrio cholerae* El Tor N16961 ORF03006 GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)

1\_4\_1\_13 6144 *Vibrio cholerae* El Tor N16961 ORF03007 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 505 *Treponema pallidum* TP0735 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1205 *Streptococcus mutans* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1206 *Streptococcus mutans* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1551 *Staphylococcus aureus* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1835 *Staphylococcus aureus* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1836 *Staphylococcus aureus* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3412 *Salmonella typhimurium* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6098 *Salmonella typhimurium* gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6101 *Salmonella typhimurium* gltD GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 735 *Salmonella typhi* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3006 *Salmonella typhi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5379 *Salmonella typhi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 895 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 898 *Salmonella paratyphi* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 899 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 901 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1354 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1355 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1356 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3430 *Salmonella paratyphi* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3431 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5149 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 7088 *Salmonella paratyphi* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2587 *Salmonella enteritidis* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3059 *Salmonella dublin* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 4130 *Saccharomyces cerevisiae* GLT1 GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6 *Rickettsia prowazekii* RP006 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2913 *Pseudomonas aeruginosa* gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5881 *Pseudomonas aeruginosa* PA0440 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 8617 *Pseudomonas aeruginosa* gltD GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 287 *Mycobacterium tuberculosis* gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 288 *Mycobacterium tuberculosis* gltD GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1625 *Mycobacterium leprae* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1626 *Mycobacterium leprae* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 994 *Mycobacterium bovis* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 995 *Mycobacterium bovis* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)

1\_4\_1\_13 6098 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6099 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6100 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6101 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6102 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6103 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6104 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6105 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6106 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6107 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6108 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6494 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6495 *Klebsiella pneumoniae* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2095 *Escherichia coli* b2146 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3135 *Escherichia coli* gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 3136 *Escherichia coli* gltD GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5497 *Escherichia coli* yffG GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5709 *Escherichia coli* b2887 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 655 *Enterococcus faecalis* BS-gltA GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1605 *Clostridium difficile* GLUTAMATE SYNTHASE (NADPH) (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2566 *Clostridium difficile* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2604 *Clostridium difficile* GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 345 *Clostridium acetobutylicum* 26460938\_C3\_119 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2102 *Clostridium acetobutylicum* 24505468\_C3\_30 GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2103 *Clostridium acetobutylicum* 5897938\_C3\_29 GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 2105 *Clostridium acetobutylicum* 34103388\_C1\_24 GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1103 *Campylobacter jejuni* gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1112 *Campylobacter jejuni* gltD GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 819 *Bordetella pertussis* GLUTAMATE SYNTHASE (NADPH) LARGE CHAIN PRECURSOR (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1273 *Bordetella pertussis* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1274 *Bordetella pertussis* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 5535 *Bordetella bronchiseptica* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 6292 *Bordetella bronchiseptica* BS-gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 7628 *Bordetella bronchiseptica* GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1843 *Bacillus subtilis* gltB GLUTAMATE SYNTHASE (NADPH) SMALL CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_13 1844 *Bacillus subtilis* gltA GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_16 523 *Porphyromonas gingivalis* MESO-DIAMINOPIMELATE D-DEHYDROGENASE (EC 1\_4\_1\_16)  
 1\_4\_1\_2 5304 *Vibrio cholerae* El Tor N16961 ORF01910 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 2950 *Saccharomyces cerevisiae* GDH2 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 202 *Pseudomonas aeruginosa* PA3068 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 971 *Porphyromonas gingivalis* EC-gdhA NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)

1\_4\_1\_2 201 *Neurospora crassa* AAA33601\_1 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 308 *Neurospora crassa* *gdh* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 204 *Neisseria gonorrhoeae* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 3099 *Mycobacterium tuberculosis* Rv2476c NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 2138 *Mycobacterium leprae* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 2464 *Mycobacterium leprae* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 440 *Mycobacterium bovis* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 1601 *Clostridium difficile* sp|P27346 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 2292 *Bacillus subtilis* *ypcA* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_2 3773 *Bacillus subtilis* *yweB* NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_4 2029 *Yersinia pestis* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 804 *Streptococcus pneumoniae* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 335 *Streptococcus mutans* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 319 *Streptococcus equi* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 2672 *Staphylococcus aureus* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 6160 *Salmonella typhimurium* *gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 3529 *Salmonella typhi* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 957 *Salmonella paratyphi* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 4113 *Salmonella dublin* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 6482 *Saccharomyces cerevisiae* GDH3 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 8270 *Saccharomyces cerevisiae* GDH1 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 7537 *Pseudomonas aeruginosa* *gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 976 *Pasteurella multocida* *gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 79 *Neurospora crassa* AAA33557\_1 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 80 *Neurospora crassa* AAA33558\_1 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 81 *Neurospora crassa* AAA33559\_1 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 20221 *Neurospora crassa* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 72 *Neisseria gonorrhoeae* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 203 *Neisseria gonorrhoeae* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 502 *Klebsiella pneumoniae* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 6084 *Klebsiella pneumoniae* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 1317 *Helicobacter pylori* HP0380 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 992 *Helicobacter pylori* J99sp|Q9ZKD8 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 7643 *Haemophilus influenzae* HI0189 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 1718 *Escherichia coli* *gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 1172 *Enterococcus faecalis* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 1796 *Corynebacterium diphtheriae* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 1800 *Clostridium acetobutylicum* 20501592\_F3\_13 NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 2947 *Bordetella pertussis* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_4 8047 *Bordetella bronchiseptica* EC-*gdhA* NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_9 5327 *Pseudomonas aeruginosa* *ldh* LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)  
 1\_4\_1\_9 742 *Chlamydia trachomatis* D/UW-3/Cx BS-yqIT LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)  
 1\_4\_1\_9 947 *Chlamydia pneumoniae* AR39 CP0947 LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)

1\_4\_1\_9 850 *Chlamydia pneumoniae* CWL029 BS-yqiT LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)  
 1\_4\_1\_9 2403 *Bacillus subtilis* yqiT LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)  
 1\_4\_3\_16 6756 *Yersinia pseudotuberculosis* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 603 *Yersinia pestis* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 6226 *Vibrio cholerae* El Tor N16961 ORF03122 L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 4328 *Salmonella typhimurium* nicB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 5253 *Salmonella typhi* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 3230 *Salmonella paratyphi* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1886 *Salmonella enteritidis* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 3108 *Salmonella dublin* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1959 *Pseudomonas aeruginosa* nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1392 *Porphyromonas gingivalis* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1087 *Neisseria gonorrhoeae* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 2617 *Mycobacterium tuberculosis* nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1573 *Mycobacterium leprae* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 3182 *Mycobacterium bovis* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 5505 *Klebsiella pneumoniae* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 2514 *Escherichia coli* nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 1184 *Corynebacterium diphtheriae* L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 2720 *Clostridium difficile* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 2132 *Clostridium acetobutylicum* 38069002\_F1\_1 L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_16 2781 *Bacillus subtilis* nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_2 1900 *Bacillus subtilis* yobN L-AMINO ACID OXIDASE (EC 1\_4\_3\_2)  
 1\_4\_7\_1 6140 *Vibrio cholerae* El Tor N16961 ORF03003 FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE I (EC 1\_4\_7\_1)  
 1\_4\_7\_1 2010 *Pseudomonas aeruginosa* PA3602 FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE (EC 1\_4\_7\_1)  
 1\_4\_7\_1 2104 *Clostridium acetobutylicum* 2581250\_C2\_27 FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE I (EC 1\_4\_7\_1)  
 1\_4\_7\_1 818 *Bordetella pertussis* FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE (EC 1\_4\_7\_1)  
 1\_4\_7\_1 3907 *Bordetella pertussis* BS-yerD FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE (EC 1\_4\_7\_1)  
 1\_4\_7\_1 6419 *Bordetella bronchiseptica* BS-yerD FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE (EC 1\_4\_7\_1)  
 1\_4\_7\_1 660 *Bacillus subtilis* yerD FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE (EC 1\_4\_7\_1)  
 1\_4\_99\_1 5331 *Yersinia pseudotuberculosis* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 6002 *Yersinia pseudotuberculosis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3789 *Yersinia pestis* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 4477 *Yersinia pestis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 4641 *Vibrio cholerae* El Tor N16961 ORF01052 D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1393 *Streptococcus pyogenes* BS-yurR D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 792 *Streptococcus pneumoniae* BS-yurR D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1186 *Streptococcus mutans* BS-yurR D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 4472 *Salmonella typhimurium* dadR D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 79 *Salmonella typhi* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2482 *Salmonella paratyphi* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2483 *Salmonella paratyphi* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 4058 *Salmonella enteritidis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2174 *Salmonella dublin* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 7387 *Pseudomonas aeruginosa* dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 8614 *Pseudomonas aeruginosa* PA5084 D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 606 *Pasteurella multocida* D-AMINO ACID DEHYDROGENASE LARGE SUBUNIT (EC 1\_4\_99\_1)

1\_4\_99\_1 502 *Neisseria gonorrhoeae* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1237 *Klebsiella pneumoniae* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2209 *Klebsiella pneumoniae* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 358 *Helicobacter pylori* HP0943 D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 875 *Helicobacter pylori* J99splQ9ZKQ7 D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1151 *Escherichia coli* dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2556 *Enterococcus faecium* (DOE) D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1315 *Enterococcus faecalis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 2028 *Corynebacterium diphtheriae* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 13 *Borrelia burgdorferi* BB0756 D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 1238 *Bordetella pertussis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3224 *Bordetella pertussis* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3265 *Bordetella pertussis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3760 *Bordetella pertussis* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 4929 *Bordetella bronchiseptica* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 5351 *Bordetella bronchiseptica* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 6155 *Bordetella bronchiseptica* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 8285 *Bordetella bronchiseptica* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 9212 *Bordetella bronchiseptica* D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3258 *Bacillus subtilis* yurR D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_4\_99\_1 3668 *Bacillus subtilis* ywmD D-AMINO ACID DEHYDROGENASE LARGE SUBUNIT (EC 1\_4\_99\_1)  
 1\_5\_1\_19 57 *Pseudomonas aeruginosa* hcnB D-nopaline dehydrogenase (EC 1\_5\_1\_19)  
 1\_5\_1\_28 1247 *Staphylococcus aureus* OPINE DEHYDROGENASE (EC 1\_5\_1\_28)  
 1\_5\_1\_7 284 *Saccharomyces cerevisiae* LYS1 SACCHAROPINE DEHYDROGENASE (NAD<sup>+</sup>, L-LYSINE FORMING) (EC 1\_5\_1\_7)  
 1\_5\_3\_1 216 *Yersinia pestis* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 5197 *Salmonella typhimurium* solA SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 1237 *Salmonella typhi* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 1527 *Salmonella paratyphi* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 1528 *Salmonella paratyphi* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 3134 *Salmonella enteritidis* PUTATIVE SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 2513 *Salmonella dublin* PUTATIVE SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 59 *Pseudomonas aeruginosa* hcnA SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 154 *Pseudomonas aeruginosa* soxD SARCOSINE OXIDASE DELTA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 5004 *Pseudomonas aeruginosa* soxG SARCOSINE OXIDASE GAMMA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 5645 *Pseudomonas aeruginosa* soxB SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 5689 *Pseudomonas aeruginosa* PA1488 SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 6006 *Pseudomonas aeruginosa* PA1028 SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 6721 *Pseudomonas aeruginosa* PA3863 SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 8077 *Pseudomonas aeruginosa* soxA SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 7136 *Klebsiella pneumoniae* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 4752 *Escherichia coli* b1059 SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_1 962 *Clostridium acetobutylicum* 789635\_C1\_51 SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 2442 *Clostridium acetobutylicum* 3942143\_C3\_29 SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 209 *Bordetella pertussis* SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)



1\_5\_3\_1 3048 *Bordetella pertussis* SARCOSINE OXIDASE GAMMA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 3049 *Bordetella pertussis* SARCOSINE OXIDASE ALPHA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 3050 *Bordetella pertussis* SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 3805 *Bordetella pertussis* SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 4755 *Bordetella pertussis* SARCOSINE OXIDASE DELTA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 8077 *Bordetella bronchiseptica* SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_1 9593 *Bordetella bronchiseptica* SARCOSINE OXIDASE BETA SUBUNIT (EC 1\_5\_3\_1)  
 1\_5\_3\_6 1593 *Yersinia pestis* 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_3\_6 3586 *Mycobacterium tuberculosis* Rv1726 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_3\_6 138 *Mycobacterium bovis* 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_3\_6 879 *Bacillus subtilis* ygaK 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_3\_6 3447 *Bacillus subtilis* yvdP 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_99\_2 2270 *Pseudomonas aeruginosa* PA5309 DIMETHYLGLYCINE DEHYDROGENASE (EC 1\_5\_99\_2)  
 1\_5\_99\_4 20548 *Neurospora crassa* NICOTINE DEHYDROGENASE (EC 1\_5\_99\_4)  
 1\_5\_99\_4 3303 *Bordetella pertussis* NICOTINE DEHYDROGENASE (EC 1\_5\_99\_4)  
 1\_5\_99\_4 3304 *Bordetella pertussis* NICOTINE DEHYDROGENASE (EC 1\_5\_99\_4)  
 1\_5\_99\_4 5052 *Bordetella bronchiseptica* NICOTINE DEHYDROGENASE (EC 1\_5\_99\_4)  
 1\_5\_99\_8 7719 *Yersinia pseudotuberculosis* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 3629 *Yersinia pestis* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 4963 *Yersinia pestis* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 7573 *Vibrio cholerae* El Tor N16961ORFA00849 PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 1984 *Staphylococcus aureus* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 1534 *Salmonella typhimurium* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 1536 *Salmonella typhimurium* putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 232 *Salmonella typhi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 465 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 1391 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 1392 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 1393 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 1394 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 6939 *Salmonella paratyphi* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 8536 *Pseudomonas aeruginosa* putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 1546 *Pasteurella multocida* putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 1077 *Neisseria gonorrhoeae* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 4414 *Mycobacterium tuberculosis* Rv1188 PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 2099 *Mycobacterium bovis* BS-yusM PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5147 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5148 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5149 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5150 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5152 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 5153 *Klebsiella pneumoniae* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)

1\_5\_99\_8 1016 *Helicobacter pylori* HP0056 PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 48 *Helicobacter pylori* J99 putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 4733 *Escherichia coli* putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 1960 *Campylobacter jejuni* putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 2799 *Bordetella pertussis* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 2801 *Bordetella pertussis* PROLINE DEHYDROGENASE (EC 1\_5\_99\_8)  
 1\_5\_99\_8 7693 *Bordetella bronchiseptica* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 321 *Bacillus subtilis* ycgM PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_8 3279 *Bacillus subtilis* yusM PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_9 825 *Mycobacterium tuberculosis* Rv2951c F420-DEPENDENT METHYLENETETRAHYDROMETHANOPTERIN DEHYDROGENASE (EC 1\_5\_99\_9)  
 1\_5\_99\_9 1655 *Mycobacterium leprae* F420-DEPENDENT METHYLENETETRAHYDROMETHANOPTERIN DEHYDROGENASE (EC 1\_5\_99\_9)  
 1\_5\_99\_9 206 *Mycobacterium bovis* F420-DEPENDENT METHYLENETETRAHYDROMETHANOPTERIN DEHYDROGENASE (EC 1\_5\_99\_9)  
 1\_6\_1\_1 2656 *Salmonella enteritidis* SOLUBLE PYRIDINE NUCLEOTIDE TRANSHYDROGENASE (EC 1\_6\_1\_1)  
 1\_6\_1\_1 833 *Rickettsia prowazekii* RP862 NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 557 *Porphyromonas gingivalis* EC-pntA NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 3626 *Mycobacterium tuberculosis* pntAB NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 2862 *Mycobacterium leprae* EC-pntA NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 866 *Mycobacterium bovis* EC-pntA NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 3738 *Bordetella pertussis* NAD(P) TRANSHYDROGENASE PRECURSOR (EC 1\_6\_1\_1)  
 1\_6\_1\_1 9560 *Bordetella bronchiseptica* NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_1\_1 9561 *Bordetella bronchiseptica* EC-pntA NAD(P) TRANSHYDROGENASE SUBUNIT ALPHA (EC 1\_6\_1\_1)  
 1\_6\_6\_1 2837 *Salmonella typhimurium* NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_1 2152 *Salmonella paratyphi* NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_1 2153 *Salmonella paratyphi* NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_1 3177 *Pseudomonas aeruginosa* PA4882 NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_1 1252 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_1 1924 *Escherichia coli* b1971 NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_3 7493 *Yersinia pseudotuberculosis* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 2955 *Yersinia pestis* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 4617 *Salmonella typhi* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 3443 *Pseudomonas aeruginosa* PA4692 NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 710 *Pasteurella multocida* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 210 *Neurospora crassa* nit-3 NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 50 *Haemophilus ducreyi* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 2378 *Campylobacter jejuni* Cj0379c NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 205 *Bordetella pertussis* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_3 7828 *Bordetella bronchiseptica* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_4 7870 *Yersinia pseudotuberculosis* EC-nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC 1\_6\_6\_4)  
 1\_6\_6\_4 7871 *Yersinia pseudotuberculosis* EC-nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC 1\_6\_6\_4)  
 1\_6\_6\_4 1482 *Yersinia pestis* EC-nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC 1\_6\_6\_4)  
 1\_6\_6\_4 1483 *Yersinia pestis* EC-nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC 1\_6\_6\_4)  
 1\_6\_6\_4 1666 *Staphylococcus aureus* BS-nasE NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC 1\_6\_6\_4)

I\_6\_6\_4 1667 *Staphylococcus aureus* EC-nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4281 *Salmonella typhimurium* nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4285 *Salmonella typhimurium* nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1465 *Salmonella typhi* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 5538 *Salmonella typhi* NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4565 *Salmonella paratyphi* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4566 *Salmonella paratyphi* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4830 *Salmonella paratyphi* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 3193 *Salmonella enteritidis* NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 3194 *Salmonella enteritidis* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 3543 *Salmonella dublin* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1480 *Pseudomonas aeruginosa* nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 8404 *Pseudomonas aeruginosa* nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 20261 *Neurospora crassa* NITRITE REDUCTASE (NAD(P)H) (EC I\_6\_6\_4)  
 I\_6\_6\_4 4034 *Mycobacterium tuberculosis* nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 4036 *Mycobacterium tuberculosis* nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 303 *Mycobacterium bovis* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1934 *Mycobacterium bovis* EC-nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1935 *Mycobacterium bovis* EC-nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1650 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1651 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 2569 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 6332 *Klebsiella pneumoniae* NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 6333 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 6334 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 6336 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 6337 *Klebsiella pneumoniae* NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 3283 *Escherichia coli* nirB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 3284 *Escherichia coli* nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 1934 *Clostridium acetobutylicum* 5120452\_C2\_31 NITRITE REDUCTASE (NAD(P)H) (EC I\_6\_6\_4)  
 I\_6\_6\_4 330 *Bacillus subtilis* nasE NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 331 *Bacillus subtilis* nasD NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_4 333 *Bacillus subtilis* nasB NITRITE REDUCTASE [NAD(P)H] LARGE SUBUNIT (EC I\_6\_6\_4)  
 I\_6\_6\_9 5490 *Vibrio cholerae* El Tor N16961 ORF02162 TRIMETHYLAMINE-N-OXIDE REDUCTASE PRECURSOR (EC I\_6\_6\_9)  
 I\_6\_6\_9 5746 *Vibrio cholerae* El Tor N16961 ORF02459 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 5854 *Salmonella typhimurium* torA TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 913 *Salmonella typhi* TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 2567 *Salmonella paratyphi* TRIMETHYLAMINE-N-OXIDE REDUCTASE PRECURSOR (EC I\_6\_6\_9)  
 I\_6\_6\_9 2568 *Salmonella paratyphi* TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 3432 *Salmonella enteritidis* TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 4052 *Salmonella dublin* TRIMETHYLAMINE-N-OXIDE REDUCTASE PRECURSOR (EC I\_6\_6\_9)  
 I\_6\_6\_9 6 *Pasteurella multocida* torA TRIMETHYLAMINE-N-OXIDE REDUCTASE PRECURSOR (EC I\_6\_6\_9)  
 I\_6\_6\_9 1344 *Helicobacter pylori* HP0407 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 965 *Helicobacter pylori* J99trQ9ZKG2 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 13279 *Haemophilus influenzae* HI0643 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 929 *Haemophilus ducreyi* EC-bisZ TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 960 *Escherichia coli* torA TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 5145 *Escherichia coli* bisZ TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)  
 I\_6\_6\_9 3925 *Clostridium acetobutylicum* 34569216\_C2\_11 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC I\_6\_6\_9)

1\_6\_6\_9 3926 *Clostridium acetobutylicum* 24695318\_C1\_8 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC 1\_6\_6\_9)  
 1\_6\_6\_9 3927 *Clostridium acetobutylicum* 31895662\_C3\_12 TRIMETHYLAMINE-N-OXIDE REDUCTASE (EC 1\_6\_6\_9)  
 1\_6\_8\_1 5170 *Yersinia pestis* NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_6\_8\_1 1004 *Staphylococcus aureus* NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_6\_8\_1 866 *Pseudomonas aeruginosa* PA3446 NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_6\_8\_1 5753 *Klebsiella pneumoniae* NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_6\_8\_1 4698 *Escherichia coli* b0937 NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_6\_8\_1 5745 *Bordetella bronchiseptica* NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_7\_7\_1 590 *Mycobacterium tuberculosis* nirA FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_7\_1 456 *Mycobacterium bovis* FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_7\_1 457 *Mycobacterium bovis* FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_7\_1 3121 *Clostridium difficile* FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_7\_1 444 *Clostridium acetobutylicum* 992202\_C2\_79 FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_99\_4 7910 *Yersinia pseudotuberculosis* EC-napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 298 *Yersinia pestis* EC-napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 7184 *Vibrio cholerae* El Tor N16961ORFA00362 PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1637 *Staphylococcus aureus* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1737 *Staphylococcus aureus* BS-narG NITRATE REDUCTASE ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1795 *Staphylococcus aureus* EC-narV NITRATE REDUCTASE GAMMA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1796 *Staphylococcus aureus* EC-narJ NITRATE REDUCTASE ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1797 *Staphylococcus aureus* EC-narY NITRATE REDUCTASE BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2874 *Salmonella typhimurium* napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3435 *Salmonella typhimurium* narH RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3436 *Salmonella typhimurium* narJ NITRATE REDUCTASE DELTA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3437 *Salmonella typhimurium* chlI RESPIRATORY NITRATE REDUCTASE 1 GAMMA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4782 *Salmonella typhimurium* narZ RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4783 *Salmonella typhimurium* narY NITRATE REDUCTASE BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4784 *Salmonella typhimurium* narW NITRATE REDUCTASE DELTA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4786 *Salmonella typhimurium* narV NITRATE REDUCTASE GAMMA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 6964 *Salmonella typhimurium* NITRATE REDUCTASE ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1646 *Salmonella typhi* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1946 *Salmonella typhi* RESPIRATORY NITRATE REDUCTASE 2 BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 1947 *Salmonella typhi* NITRATE REDUCTASE DELTA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2169 *Salmonella typhi* RESPIRATORY NITRATE REDUCTASE 1 GAMMA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2543 *Salmonella typhi* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3755 *Salmonella typhi* NITRATE REDUCTASE (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4522 *Salmonella typhi* NITRATE REDUCTASE DELTA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4523 *Salmonella typhi* RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4940 *Salmonella typhi* NITRATE REDUCTASE ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2405 *Salmonella paratyphi* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2406 *Salmonella paratyphi* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 2408 *Salmonella paratyphi* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3556 *Salmonella paratyphi* NITRATE REDUCTASE (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3942 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 3943 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4298 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 GAMMA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4299 *Salmonella paratyphi* NITRATE REDUCTASE ALPHA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4300 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4301 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 BETA CHAIN (EC 1\_7\_99\_4)  
 1\_7\_99\_4 4302 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 BETA CHAIN (EC 1\_7\_99\_4)

I\_7\_99\_4 4304 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4306 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5005 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5008 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5009 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5010 *Salmonella paratyphi* RESPIRATORY NITRATE REDUCTASE 1 DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5011 *Salmonella paratyphi* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5012 *Salmonella paratyphi* NITRATE REDUCTASE GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1201 *Salmonella enteritidis* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 2051 *Salmonella enteritidis* RESPIRATORY NITRATE REDUCTASE 1 BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 2600 *Salmonella enteritidis* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3544 *Salmonella enteritidis* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3545 *Salmonella enteritidis* NITRATE REDUCTASE GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 362 *Salmonella dublin* RESPIRATORY NITRATE REDUCTASE 2 BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1389 *Salmonella dublin* RESPIRATORY NITRATE REDUCTASE 1 DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1748 *Salmonella dublin* RESPIRATORY NITRATE REDUCTASE 2 GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4072 *Salmonella dublin* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 4309 *Salmonella dublin* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 2592 *Pseudomonas aeruginosa* napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 3522 *Pseudomonas aeruginosa* narJ NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3523 *Pseudomonas aeruginosa* narI RESPIRATORY NITRATE REDUCTASE 2 GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 6713 *Pseudomonas aeruginosa* narG NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 6714 *Pseudomonas aeruginosa* narH RESPIRATORY NITRATE REDUCTASE 2 BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 8403 *Pseudomonas aeruginosa* PA1779 NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 351 *Pasteurella multocida* napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 1232 *Mycobacterium tuberculosis* narX NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4387 *Mycobacterium tuberculosis* narG NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4388 *Mycobacterium tuberculosis* narH NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4389 *Mycobacterium tuberculosis* narJ NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4390 *Mycobacterium tuberculosis* narI NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 170 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4) (fragment)  
 I\_7\_99\_4 173 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4) (fragment)  
 I\_7\_99\_4 174 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 176 *Mycobacterium leprae* NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 177 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1771 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1772 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1773 *Mycobacterium leprae* NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 2905 *Mycobacterium leprae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1148 *Mycobacterium bovis* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1370 *Mycobacterium bovis* NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1371 *Mycobacterium bovis* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1802 *Mycobacterium bovis* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3802 *Mycobacterium bovis* EC-narY NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3803 *Mycobacterium bovis* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3804 *Mycobacterium bovis* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1532 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1533 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1534 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 1 ALPHA CHAIN (EC I\_7\_99\_4)

I\_7\_99\_4 1535 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE I ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1605 *Klebsiella pneumoniae* Respiratory nitrate reductase I alpha chain (EC I\_7\_99\_4)  
 I\_7\_99\_4 1606 *Klebsiella pneumoniae* Respiratory nitrate reductase I alpha chain (EC I\_7\_99\_4)  
 I\_7\_99\_4 1607 *Klebsiella pneumoniae* Respiratory nitrate reductase I alpha chain (EC I\_7\_99\_4)  
 I\_7\_99\_4 1608 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE I ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1652 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 1653 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 1654 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 1655 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 1656 *Klebsiella pneumoniae* NITRATE REDUCTASE (EC I\_7\_99\_4)  
 I\_7\_99\_4 7640 *Klebsiella pneumoniae* NITRATE REDUCTASE GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7641 *Klebsiella pneumoniae* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7642 *Klebsiella pneumoniae* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7643 *Klebsiella pneumoniae* NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7644 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7645 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7646 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7647 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE 2 ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7648 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE I ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 7649 *Klebsiella pneumoniae* RESPIRATORY NITRATE REDUCTASE I ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 8781 *Klebsiella pneumoniae* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 8782 *Klebsiella pneumoniae* NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4403 *Haemophilus influenzae* HI0344 PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 1295 *Haemophilus ducreyi* EC-napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 1186 *Escherichia coli* narG RESPIRATORY NITRATE REDUCTASE I ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1187 *Escherichia coli* narH RESPIRATORY NITRATE REDUCTASE I BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1188 *Escherichia coli* narJ NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1189 *Escherichia coli* narI RESPIRATORY NITRATE REDUCTASE I GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4919 *Escherichia coli* narV RESPIRATORY NITRATE REDUCTASE 2 GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4920 *Escherichia coli* narW NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4921 *Escherichia coli* narY NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 4922 *Escherichia coli* narZ NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 5339 *Escherichia coli* napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 1723 *Corynebacterium diphtheriae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1724 *Corynebacterium diphtheriae* NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1725 *Corynebacterium diphtheriae* NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1726 *Corynebacterium diphtheriae* NITRATE REDUCTASE GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 1335 *Campylobacter jejuni* napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 7385 *Bordetella bronchiseptica* PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC I\_7\_99\_4)  
 I\_7\_99\_4 332 *Bacillus subtilis* nasC ASSIMILATORY NITRATE REDUCTASE CATALYTIC SUBUNIT (EC I\_7\_99\_4)  
 I\_7\_99\_4 3720 *Bacillus subtilis* narI NITRATE REDUCTASE GAMMA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3721 *Bacillus subtilis* narJ NITRATE REDUCTASE DELTA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3722 *Bacillus subtilis* narH NITRATE REDUCTASE BETA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_4 3723 *Bacillus subtilis* narG NITRATE REDUCTASE ALPHA CHAIN (EC I\_7\_99\_4)  
 I\_7\_99\_5 6038 *Yersinia pseudotuberculosis* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)

I\_7\_99\_5 574 *Yersinia pestis* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 1499 *Yersinia pestis* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 6433 *Vibrio cholerae* El Tor N16961 ORF03396 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 501 *Streptococcus pneumoniae* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 593 *Salmonella typhimurium* metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 2485 *Salmonella typhi* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 4529 *Salmonella paratyphi* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 2037 *Salmonella enteritidis* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 3308 *Pseudomonas aeruginosa* metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 1323 *Pasteurella multocida* metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 1816 *Neisseria gonorrhoeae* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 7488 *Klebsiella pneumoniae* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 6620 *Haemophilus influenzae* HI1444 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 3839 *Escherichia coli* metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 1260 *Corynebacterium diphtheriae* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 2911 *Campylobacter jejuni* metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 1125 *Bordetella pertussis* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 4811 *Bordetella pertussis* 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_5 8084 *Bordetella bronchiseptica* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC I\_7\_99\_5)  
 I\_7\_99\_6 356 *Pseudomonas aeruginosa* nosZ NITROUS-OXIDE REDUCTASE (EC I\_7\_99\_6)  
 I\_7\_99\_6 1634 *Neisseria gonorrhoeae* NITROUS-OXIDE REDUCTASE (EC I\_7\_99\_6)  
 I\_7\_99\_6 1635 *Neisseria gonorrhoeae* NITROUS-OXIDE REDUCTASE (EC I\_7\_99\_6)  
 I\_7\_99\_7 1406 *Pseudomonas aeruginosa* norB NITRIC-OXIDE REDUCTASE SUBUNIT B (EC I\_7\_99\_7)  
 I\_7\_99\_7 7666 *Pseudomonas aeruginosa* norC nitric-oxide reductase (EC I\_7\_99\_7) cytochrome c chain - *Pseudomonas aeruginosa*  
 I\_7\_99\_7 208 *Neisseria gonorrhoeae* NITRIC-OXIDE REDUCTASE SUBUNIT B (EC I\_7\_99\_7)  
 I\_7\_99\_7 1821 *Corynebacterium diphtheriae* nitric-oxide reductase (EC I\_7\_99\_7) cytochrome c chain  
 I\_7\_99\_7 2152 *Corynebacterium diphtheriae* NITRIC-OXIDE REDUCTASE SUBUNIT B (EC I\_7\_99\_7)  
 I\_8\_1\_2 4928 *Yersinia pseudotuberculosis* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 6905 *Yersinia pseudotuberculosis* EC-cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 6906 *Yersinia pseudotuberculosis* EC-cysI SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 1033 *Yersinia pestis* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 1578 *Yersinia pestis* EC-cysI SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 1579 *Yersinia pestis* EC-cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 4259 *Vibrio cholerae* El Tor N16961 ORF00539 SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 4260 *Vibrio cholerae* El Tor N16961 ORF00541 SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC I\_8\_1\_2)  
 I\_8\_1\_2 1443 *Staphylococcus aureus* EC-cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC I\_8\_1\_2)

1\_8\_1\_2 3708 *Salmonella typhimurium* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 5996 *Salmonella typhimurium* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 5997 *Salmonella typhimurium* cysI SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 5998 *Salmonella typhimurium* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 5999 *Salmonella typhimurium* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6000 *Salmonella typhimurium* cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 1664 *Salmonella typhi* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 1733 *Salmonella typhi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 2607 *Salmonella typhi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 2011 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6281 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6282 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6283 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6284 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6285 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6286 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 6287 *Salmonella paratyphi* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 726 *Salmonella enteritidis* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 3272 *Salmonella enteritidis* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 582 *Salmonella dublin* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 3712 *Salmonella dublin* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 4125 *Saccharomyces cerevisiae* MET10 SULFITE REDUCTASE [NADPH] FLAVOPROTEIN COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 857 *Pseudomonas aeruginosa* PA4513 SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 7534 *Pseudomonas aeruginosa* PA3435 SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 890 *Neisseria gonorrhoeae* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 892 *Neisseria gonorrhoeae* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 893 *Neisseria gonorrhoeae* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 894 *Neisseria gonorrhoeae* SULFITE REDUCTASE (NADPH) (EC 1\_8\_1\_2)  
1\_8\_1\_2 4102 *Klebsiella pneumoniae* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 4730 *Klebsiella pneumoniae* SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
1\_8\_1\_2 4731 *Klebsiella pneumoniae* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)



1\_8\_1\_2 4732 *Klebsiella pneumoniae* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 5642 *Escherichia coli* cysI SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 5643 *Escherichia coli* cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 5662 *Escherichia coli* b2790 SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 2495 *Bordetella pertussis* EC-cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 8556 *Bordetella bronchiseptica* EC-cysJ SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 3338 *Bacillus subtilis* yvgQ SULFITE REDUCTASE (NADPH) HEMOPROTEIN BETA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_1\_2 3339 *Bacillus subtilis* yvgR SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_7\_1 6122 *Saccharomyces cerevisiae* ECM17 SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_7\_1 556 *Pseudomonas aeruginosa* cysI SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_7\_1 5599 *Pseudomonas aeruginosa* PA4130 SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_7\_1 2321 *Bordetella pertussis* SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_7\_1 2322 *Bordetella pertussis* SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_7\_1 9757 *Bordetella bronchiseptica* SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_99\_2 5628 *Pseudomonas aeruginosa* PA2298 ADENYLYL-SULPHATE REDUCTASE ALFA-SUBUNIT (EC 1\_8\_99\_2)  
 1\_8\_99\_2 8245 *Pseudomonas aeruginosa* PA2297 ADENYLYLSULPHATE REDUCTASE BETA-SUBUNIT (EC 1\_8\_99\_2)  
 1\_8\_99\_2 434 *Clostridium acetobutylicum* 13829432\_C3\_89 ADENYLYLSULPHATE REDUCTASE BETA-SUBUNIT (EC 1\_8\_99\_2)  
 1\_8\_99\_2 435 *Clostridium acetobutylicum* 24254662\_C2\_83 ADENYLYL-SULPHATE REDUCTASE ALFA-SUBUNIT (EC 1\_8\_99\_2)  
 1\_8\_99\_3 3722 *Yersinia pestis* EC-yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 5181 *Vibrio cholerae* El Tor N16961 ORF01748 SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 2916 *Salmonella typhimurium* yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 1311 *Salmonella typhi* SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 5860 *Salmonella paratyphi* SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 6761 *Pseudomonas aeruginosa* PA2608 SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 1416 *Pasteurella multocida* EC-yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 2969 *Klebsiella pneumoniae* SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 18975 *Haemophilus influenzae* HI1371 SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 436 *Haemophilus ducreyi* EC-yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_8\_99\_3 4710 *Escherichia coli* yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_9\_3\_2 1909 *Pseudomonas aeruginosa* nirS NITRITE REDUCTASE PRECURSOR (EC 1\_9\_3\_2)  
 1\_9\_3\_2 6070 *Pseudomonas aeruginosa* nirN NITRITE REDUCTASE PRECURSOR (EC 1\_9\_3\_2)  
 2\_1\_1\_10 252 *Escherichia coli* yagD HOMOCYSTEINE S-METHYLTRANSFERASE (EC 2\_1\_1\_10)  
 2\_1\_1\_10 242 *Bacillus subtilis* ybgG HOMOCYSTEINE S-METHYLTRANSFERASE (EC 2\_1\_1\_10)  
 2\_1\_1\_100 2200 *Saccharomyces cerevisiae* STE14 PROTEIN-S ISOPRENYLCYSTEINE O-METHYLTRANSFERASE (EC 2\_1\_1\_100)  
 2\_1\_1\_104 703 *Streptococcus pyogenes* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 415 *Streptococcus pneumoniae* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)

2\_1\_1\_104 780 *Streptococcus mutans* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 863 *Staphylococcus aureus* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 3498 *Pseudomonas aeruginosa* PA1200 CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 8233 *Pseudomonas aeruginosa* PA1402 CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 1581 *Porphyromonas gingivalis* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 911 *Neisseria gonorrhoeae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 3179 *Mycobacterium tuberculosis* Rv0187 CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 4631 *Mycobacterium tuberculosis* Rv1220c CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 1126 *Mycobacterium leprae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 574 *Mycobacterium bovis* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 4619 *Klebsiella pneumoniae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 4620 *Klebsiella pneumoniae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 4621 *Klebsiella pneumoniae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 1441 *Enterococcus faecium* (DOE) CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 1583 *Enterococcus faecalis* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 812 *Corynebacterium diphtheriae* CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 3073 *Clostridium difficile* BS-yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 2090 *Clostridium acetobutylicum* 24508500\_F2\_7 CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_104 2729 *Bacillus subtilis* yrrM CAFFEYOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_107 6879 *Yersinia pseudotuberculosis* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 7867 *Yersinia pseudotuberculosis* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 1480 *Yersinia pestis* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 1594 *Yersinia pestis* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 4929 *Yersinia pestis* EC-cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 4002 *Vibrio cholerae* El Tor N16961 ORF00169 PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 5188 *Vibrio cholerae* El Tor N16961 ORF01755 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 1665 *Staphylococcus aureus* EC-cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 3208 *Staphylococcus aureus* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 3397 *Staphylococcus aureus* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 101 *Salmonella typhimurium* cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 4167 *Salmonella typhimurium* hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 5157 *Salmonella typhimurium* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 925 *Salmonella typhi* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 2314 *Salmonella typhi* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 5041 *Salmonella typhi* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 2128 *Salmonella paratyphi* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 215 *Salmonella enteritidis* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)

2\_1\_1\_107 2107 *Salmonella dublin* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 2432 *Salmonella dublin* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 6925 *Saccharomyces cerevisiae* MET1 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 337 *Pseudomonas aeruginosa* cobA UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 4900 *Pseudomonas aeruginosa* PA5258 PUTATIVE UROPORPHYRIN-III C-  
 METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 6068 *Pseudomonas aeruginosa* PA0510 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 6759 *Pseudomonas aeruginosa* cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 815 *Pasteurella multocida* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE  
 (EC 2\_1\_1\_107)  
 2\_1\_1\_107 1416 *Neisseria gonorrhoeae* EC-hemX PUTATIVE UROPORPHYRIN-III C-  
 METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 1821 *Mycobacterium tuberculosis* cysG2 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 2199 *Mycobacterium tuberculosis* cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 336 *Mycobacterium leprae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 487 *Mycobacterium bovis* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 2177 *Mycobacterium bovis* EC-cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 951 *Klebsiella pneumoniae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 3243 *Klebsiella pneumoniae* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 5822 *Klebsiella pneumoniae* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 5825 *Klebsiella pneumoniae* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 6330 *Klebsiella pneumoniae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 8382 *Klebsiella pneumoniae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 17041 *Haemophilus influenzae* m[G3212196 PUTATIVE UROPORPHYRIN-III C-  
 METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 20668 *Haemophilus influenzae* HI0603 PUTATIVE UROPORPHYRIN-III C-  
 METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 501 *Haemophilus ducreyi* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE  
 (EC 2\_1\_1\_107)  
 2\_1\_1\_107 3286 *Escherichia coli* cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 6201 *Escherichia coli* hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 605 *Enterococcus faecium* (DOE) PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE  
 (EC 2\_1\_1\_107)  
 2\_1\_1\_107 898 *Corynebacterium diphtheriae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 2211 *Corynebacterium diphtheriae* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107)  
 2\_1\_1\_107 916 *Clostridium difficile* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) /  
 UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 441 *Clostridium acetobutylicum* 34181553\_C1\_70 UROPORPHYRIN-III C-  
 METHYLTRANSFERASE (EC 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 231 *Chlamydia pneumoniae* AR39 CP0231 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC  
 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)

2\_1\_1\_107 474 *Chlamydia pneumoniae* CWL029 CPn0522 UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 274 *Bordetella pertussis* UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 2143 *Bordetella pertussis* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 2171 *Bordetella pertussis* EC-cysG UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_107 4506 *Bordetella pertussis* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 5282 *Bordetella bronchiseptica* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 9596 *Bordetella bronchiseptica* EC-hemX PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 329 *Bacillus subtilis* nasF UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / UROPORPHYRINOGEN-III SYNTHASE (EC 4\_2\_1\_75)  
 2\_1\_1\_107 1562 *Bacillus subtilis* ylnD UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_107 1564 *Bacillus subtilis* ylnF UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107) / PRECORRIN-2 OXIDASE (EC 1\_-\_-\_-) / FERROCHELATASE (EC 4\_99\_1\_-)  
 2\_1\_1\_113 6162 *Yersinia pseudotuberculosis* MODIFICATION METHYLASE CFR9I (EC 2\_1\_1\_113)  
 2\_1\_1\_113 4697 *Yersinia pestis* MODIFICATION METHYLASE MVAI (EC 2\_1\_1\_113)  
 2\_1\_1\_113 1760 *Streptococcus equi* MODIFICATION METHYLASE CFR9I (EC 2\_1\_1\_113)  
 2\_1\_1\_113 629 *Helicobacter pylori* J99trQ9ZLF1 MODIFICATION METHYLASE CFRBI (EC 2\_1\_1\_113)  
 2\_1\_1\_113 3474 *Clostridium difficile* MODIFICATION METHYLASE CFR9I (EC 2\_1\_1\_113)  
 2\_1\_1\_114 1883 *Saccharomyces cerevisiae* COQ3 HEXAPRENYLDIHYDROXYBENZOATE METHYLTRANSFERASE PRECURSOR (EC 2\_1\_1\_114)  
 2\_1\_1\_130 978 *Salmonella typhimurium* cbiL PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 2587 *Salmonella typhi* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 2113 *Salmonella paratyphi* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 3656 *Salmonella dublin* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 3113 *Pseudomonas aeruginosa* cobI PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 305 *Porphyromonas gingivalis* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 1221 *Mycobacterium tuberculosis* cobI PRECORRIN-2 C-20METHYLTRANSFERASE (EC 2\_1\_1\_130) / PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_130 6271 *Klebsiella pneumoniae* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_130 918 *Clostridium difficile* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130) / CBIK PROTEIN  
 2\_1\_1\_130 2058 *Clostridium acetobutylicum* 19532655\_C1\_23 PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_131 975 *Salmonella typhimurium* cbiH PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 2590 *Salmonella typhi* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 6928 *Salmonella paratyphi* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 3261 *Salmonella enteritidis* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 3111 *Pseudomonas aeruginosa* cobJ PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 591 *Porphyromonas gingivalis* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 1701 *Porphyromonas gingivalis* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 1221 *Mycobacterium tuberculosis* cobI PRECORRIN-2 C-20METHYLTRANSFERASE (EC 2\_1\_1\_130) / PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 2413 *Mycobacterium bovis* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 6265 *Klebsiella pneumoniae* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 6266 *Klebsiella pneumoniae* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 1524 *Corynebacterium diphtheriae* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 920 *Clostridium difficile* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_131 2055 *Clostridium acetobutylicum* 34027217\_C2\_28 PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_132 971 *Salmonella typhimurium* cbiE PRECORRIN-6Y C5,15-METHYLTRANSFERASE (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 218 *Salmonella typhi* PRECORRIN-6Y C5,15-METHYLTRANSFERASE (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 219 *Salmonella typhi* PRECORRIN-6Y C5,15-METHYLTRANSFERASE (DECARBOXYLATING) (EC 2\_1\_1\_132)

2\_1\_1\_132 1448 *Salmonella enteritidis* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 5846 *Pseudomonas aeruginosa* cobL PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 1193 *Mycobacterium tuberculosis* cobL PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 2419 *Mycobacterium bovis* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 2443 *Klebsiella pneumoniae* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 1521 *Corynebacterium diphtheriae* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 924 *Clostridium difficile* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_132 4429 *Clostridium acetobutylicum* PRECORRIN-6Y C5,15-METHYLTRANSFERASE  
 (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_133 973 *Salmonella typhimurium* cbiF PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 217 *Salmonella typhi* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 2596 *Salmonella enteritidis* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 1601 *Salmonella dublin* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 295 *Pseudomonas aeruginosa* cobM PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 6260 *Klebsiella pneumoniae* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 1522 *Corynebacterium diphtheriae* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_133 922 *Clostridium difficile* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_14 5982 *Yersinia pseudotuberculosis* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1748 *Yersinia pestis* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 5502 *Vibrio cholerae* El Tor N16961 ORF02177 5-  
 METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE METHYLTRANSFERASE (EC  
 2\_1\_1\_14)  
 2\_1\_1\_14 500 *Streptococcus pneumoniae* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1335 *Streptococcus mutans* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1371 *Streptococcus mutans* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3357 *Staphylococcus aureus* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 5822 *Salmonella typhimurium* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1635 *Salmonella typhi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE  
 METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 146 *Salmonella paratyphi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 147 *Salmonella paratyphi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 733 *Salmonella paratyphi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 734 *Salmonella paratyphi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 735 *Salmonella paratyphi* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 2443 *Salmonella enteritidis* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1686 *Salmonella dublin* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE  
 METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 6919 *Saccharomyces cerevisiae* MET6 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 2236 *Pseudomonas aeruginosa* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)

2\_1\_1\_14 1435 *Pasteurella multocida* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 20307 *Neurospora crassa* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 20371 *Neurospora crassa* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 145 *Neisseria gonorrhoeae* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 2272 *Mycobacterium tuberculosis* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1727 *Mycobacterium leprae* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 952 *Mycobacterium bovis* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 2421 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3971 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3972 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3973 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3974 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 4275 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 6192 *Klebsiella pneumoniae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 14710 *Haemophilus influenzae* HI1702 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 6587 *Escherichia coli* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1557 *Enterococcus faecalis* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 2042 *Corynebacterium diphtheriae* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 305 *Chlamydia pneumoniae* AR39 CP0305 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 630 *Chlamydia pneumoniae* AR39 CP0630 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 129 *Chlamydia pneumoniae* CWL029 yxjG 1 5-  
 METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE METHYLTRANSFERASE (EC  
 2\_1\_1\_14)  
 2\_1\_1\_14 405 *Chlamydia pneumoniae* CWL029 yxjG 2 5-  
 METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE METHYLTRANSFERASE (EC  
 2\_1\_1\_14)  
 2\_1\_1\_14 2511 *Campylobacter jejuni* metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 555 *Bordetella pertussis* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 6444 *Bordetella bronchiseptica* EC-metE 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 1319 *Bacillus subtilis* metC 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3888 *Bacillus subtilis* yxjH 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_14 3889 *Bacillus subtilis* yxjG 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--  
 HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_16 2534 *Saccharomyces cerevisiae* OPI3 METHYLENE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE  
 (EC 2\_1\_1\_16)  
 2\_1\_1\_34 7362 *Yersinia pseudotuberculosis* EC-spoU TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE  
 (EC 2\_1\_1\_34)

2\_1\_1\_34 2304 *Yersinia pestis* EC-spoU TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 6031 *Salmonella typhimurium* spoU TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 2095 *Salmonella typhi* TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 185 *Salmonella paratyphi* TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 4134 *Salmonella dublin* TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 7955 *Klebsiella pneumoniae* TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 3571 *Escherichia coli* spoU TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_34 680 *Borrelia burgdorferi* BB0052 TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_35 7315 *Yersinia pseudotuberculosis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 7649 *Yersinia pseudotuberculosis* EC-trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 705 *Yersinia pestis* EC-trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4065 *Yersinia pestis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 688 *Vibrio cholerae* El Tor N16961 ORF03100 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4038 *Vibrio cholerae* El Tor N16961 ORF00217 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 7429 *Vibrio cholerae* El Tor N16961 ORF00670 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 217 *Streptococcus pyogenes* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1768 *Streptococcus pyogenes* BS-yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 361 *Streptococcus pneumoniae* BS-yefA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 570 *Streptococcus pneumoniae* BS-yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 759 *Streptococcus mutans* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1271 *Streptococcus mutans* BS-yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1612 *Streptococcus equi* BS-yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1777 *Streptococcus equi* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3206 *Staphylococcus aureus* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 850 *Salmonella typhimurium* trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2784 *Salmonella typhimurium* ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4199 *Salmonella typhimurium* ybjF TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2162 *Salmonella typhi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2274 *Salmonella typhi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4480 *Salmonella typhi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3522 *Salmonella paratyphi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3560 *Salmonella paratyphi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3911 *Salmonella paratyphi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3912 *Salmonella paratyphi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3913 *Salmonella paratyphi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2238 *Salmonella enteritidis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 5275 *Salmonella enteritidis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1509 *Salmonella dublin* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2517 *Salmonella dublin* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3929 *Salmonella dublin* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3930 *Salmonella dublin* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1008 *Pseudomonas aeruginosa* ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3222 *Pseudomonas aeruginosa* trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1506 *Porphyromonas gingivalis* BS-yefA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 826 *Pasteurella multocida* trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 950 *Pasteurella multocida* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1140 *Pasteurella multocida* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 450 *Neisseria gonorrhoeae* EC-trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1498 *Mycobacterium tuberculosis* Rv2689c TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2716 *Mycobacterium bovis* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1693 *Klebsiella pneumoniae* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1694 *Klebsiella pneumoniae* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)

2\_1\_1\_35 3467 *Klebsiella pneumoniae* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3806 *Klebsiella pneumoniae* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4384 *Haemophilus influenzae* HI0333 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 5418 *Haemophilus influenzae* HI0848 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 19855 *Haemophilus influenzae* HI0958 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 481 *Haemophilus ducreyi* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 737 *Haemophilus ducreyi* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1187 *Haemophilus ducreyi* EC-trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 826 *Escherichia coli* b0859 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 5658 *Escherichia coli* ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 6270 *Escherichia coli* trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1653 *Enterococcus faecium* (DOE) EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 500 *Enterococcus faecalis* BS-yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2455 *Enterococcus faecalis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 1991 *Corynebacterium diphtheriae* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 25 *Clostridium difficile* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 3331 *Clostridium difficile* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 358 *Clostridium acetobutylicum* 36134392\_C3\_152 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 2418 *Clostridium acetobutylicum* 24628558\_C3\_18 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 712 *Chlamydia trachomatis* D/UW-3/Cx BS-yefA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 981 *Chlamydia pneumoniae* AR39 CP0981 TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 817 *Chlamydia pneumoniae* CWL029 ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 388 *Campylobacter jejuni* trmA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 4385 *Bordetella pertussis* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 5322 *Bordetella bronchiseptica* EC-ygcA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 674 *Bacillus subtilis* yefA TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_35 802 *Bacillus subtilis* yfjO TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_41 4901 *Saccharomyces cerevisiae* ERG6 DELTA(24)-STEROL C-METHYLTRANSFERASE (EC 2\_1\_1\_41)  
 2\_1\_1\_48 841 *Staphylococcus aureus* RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_48 5781 *Mycobacterium tuberculosis* Rv1988 RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_48 2625 *Enterococcus faecium* (DOE) RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_48 1041 *Enterococcus faecalis* trlQ54945 RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_48 1086 *Clostridium difficile* trlQ9WW64 RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_51 5798 *Vibrio cholerae* El Tor NI6961. ORF02531 RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 5462 *Salmonella typhimurium* rrmA RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 1593 *Salmonella typhi* RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 2386 *Salmonella dublin* RIBOSOMAL RNA LARGE SUBUNIT METHYLTRANSFERASE A (EC 2\_1\_1\_51)  
 2\_1\_1\_51 7223 *Klebsiella pneumoniae* RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 5115 *Escherichia coli* yebH RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 2311 *Enterococcus faecalis* EC-yebH RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_51 3894 *Bacillus subtilis* yxjB RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_52 6485 *Yersinia pseudotuberculosis* EC-yjjT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 6812 *Yersinia pseudotuberculosis* EC-ygjO RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)



2\_1\_1\_52 421 *Yersinia pestis* EC-yjyT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 3940 *Yersinia pestis* EC-ygiO RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 4482 *Vibrio cholerae* El Tor N16961 ORF00850 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1294 *Streptococcus pyogenes* BS-ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1030 *Streptococcus pneumoniae* BS-ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 555 *Streptococcus mutans* BS-ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1327 *Streptococcus equi* BS-ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1927 *Salmonella typhimurium* yjyT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 3674 *Salmonella typhimurium* ygiO RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1680 *Salmonella typhi* RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 2664 *Salmonella typhi* RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 4544 *Salmonella dublin* PUTATIVE RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE D (EC 2\_1\_1\_52)  
 2\_1\_1\_52 6423 *Pseudomonas aeruginosa* PA4627 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 7033 *Pseudomonas aeruginosa* PA4617 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1751 *Pasteurella multocida* EC-yjyT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 4887 *Klebsiella pneumoniae* RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1384 *Helicobacter pylori* J99tr|Q9ZJB6 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 7230 *Haemophilus influenzae* HI0012 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 1390 *Haemophilus ducreyi* EC-yjyT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 5821 *Escherichia coli* ygiO RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 6468 *Escherichia coli* yjyT RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 756 *Enterococcus faecalis* BS-ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 562 *Campylobacter jejuni* Cj0495 RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_52 106 *Bacillus subtilis* ybxB RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_64 5749 *Yersinia pseudotuberculosis* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 347 *Yersinia pestis* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2706 *Yersinia pestis* EC-yafE 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 5082 *Vibrio cholerae* El Tor N16961 ORF01630 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2308 *Staphylococcus aureus* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1731 *Salmonella typhimurium* ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1804 *Salmonella typhimurium* yafE 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)

2\_1\_1\_64 442 *Salmonella typhi* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1082 *Salmonella typhi* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2337 *Salmonella paratyphi* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 6873 *Salmonella paratyphi* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 697 *Salmonella enteritidis* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 3902 *Salmonella dublin* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 600 *Rickettsia prowazekii* RP622 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 589 *Pseudomonas aeruginosa* PA3119 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2405 *Pseudomonas aeruginosa* ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 4890 *Pseudomonas aeruginosa* PA0547 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 5416 *Pseudomonas aeruginosa* PA1216 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 638 *Porphyromonas gingivalis* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 276 *Pasteurella multocida* ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1480 *Neisseria gonorrhoeae* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2384 *Mycobacterium tuberculosis* ubiE 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 432 *Mycobacterium bovis* EC-yigO 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2467 *Klebsiella pneumoniae* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 3487 *Klebsiella pneumoniae* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1363 *Helicobacter pylori* J99tr|Q9ZJD6 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 495 *Haemophilus ducreyi* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 204 *Escherichia coli* yafE 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2181 *Escherichia coli* ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 980 *Enterococcus faecium* (DOE) EC-yigO 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 735 *Corynebacterium diphtheriae* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 865 *Corynebacterium diphtheriae* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1460 *Corynebacterium diphtheriae* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 1272 *Clostridium acetobutylicum* 286687\_C1\_46 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 2240 *Clostridium acetobutylicum* 36600002\_C1\_28 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 131 *Chlamydia trachomatis* D/UW-3/Cx CT133 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 580 *Chlamydia pneumoniae* AR39 CP0580 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 199 *Bordetella pertussis* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 393 *Bordetella pertussis* EC-yafE 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)

2\_1\_1\_64 1459 *Bordetella pertussis* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 6654 *Bordetella bronchiseptica* EC-yaFe 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 7004 *Bordetella bronchiseptica* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 8762 *Bordetella bronchiseptica* EC-ubiG 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_64 317 *Bacillus subtilis* ycgJ 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_72 5839 *Yersinia pseudotuberculosis* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 7260 *Yersinia pseudotuberculosis* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 555 *Yersinia pestis* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2847 *Yersinia pestis* trjQ68789 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5849 *Yersinia pestis* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6375 *Vibrio cholerae* El Tor N16961 ORF03322 ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 220 *Ureaplasma urealyticum* hsdM-I TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 617 *Ureaplasma urealyticum* UU477 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 443 *Treponema pallidum* TP0810 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1419 *Streptococcus pyogenes* BS-ytxK MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1144 *Streptococcus pneumoniae* EC-hsdM TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1581 *Streptococcus pneumoniae* TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1697 *Streptococcus pneumoniae* EC-yhdJ MODIFICATION METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 320 *Streptococcus mutans* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 362 *Streptococcus mutans* EC-yhdJ ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 430 *Streptococcus mutans* BS-ytxK MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 585 *Streptococcus equi* BS-ytxK MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1341 *Streptococcus equi* MODIFICATION METHYLASE STSI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1645 *Streptococcus equi* EC-yhdJ ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1727 *Streptococcus equi* SITE-SPECIFIC DNA-METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1816 *Streptococcus equi* MODIFICATION METHYLASE PSTI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2700 *Staphylococcus aureus* BS-ytxK MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3747 *Staphylococcus aureus* MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 527 *Salmonella typhimurium* TYPE I RESTRICTION ENZYME STYSJI M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2718 *Salmonella typhimurium* mod TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3372 *Salmonella typhimurium* hsdT TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5379 *Salmonella typhimurium* dam ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5909 *Salmonella typhimurium* yhdJ ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6212 *Salmonella typhimurium* TYPE IIS RESTRICTION ENZYME (EC 3\_1\_21\_4) (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6341 *Salmonella typhimurium* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6717 *Salmonella typhimurium* ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 163 *Salmonella typhi* ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1156 *Salmonella typhi* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2710 *Salmonella typhi* PUTATIVE ADENINE-SPECIFIC METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3859 *Salmonella typhi* TYPE I RESTRICTION ENZYME STYSPI M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3860 *Salmonella typhi* TYPE I RESTRICTION ENZYME STYSPI M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5415 *Salmonella typhi* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5627 *Salmonella typhi* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1115 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME STYSPI M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2610 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2611 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3050 *Salmonella paratyphi* MODIFICATION METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3154 *Salmonella paratyphi* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)

2\_1\_1\_72 3727 *Salmonella paratyphi* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3728 *Salmonella paratyphi* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3729 *Salmonella paratyphi* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5517 *Salmonella paratyphi* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6051 *Salmonella paratyphi* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1072 *Salmonella enteritidis* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2583 *Salmonella enteritidis* MODIFICATION METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5105 *Salmonella enteritidis* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 342 *Salmonella dublin* RETRON EC67 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 369 *Salmonella dublin* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1612 *Salmonella dublin* ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1673 *Salmonella dublin* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1740 *Salmonella dublin* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2096 *Salmonella dublin* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 866 *Pasteurella multocida* dam ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1632 *Pasteurella multocida* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 697 *Neisseria gonorrhoeae* O30358 MODIFICATION METHYLASE HPHI(A) (EC 2\_1\_1\_72)  
 2\_1\_1\_72 924 *Neisseria gonorrhoeae* EC-yhdJ ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1278 *Neisseria gonorrhoeae* Q9ZIE8 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1550 *Neisseria gonorrhoeae* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2037 *Neisseria gonorrhoeae* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2038 *Neisseria gonorrhoeae* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 634 *Mycoplasma pneumoniae* mteI MODIFICATION METHYLASE ECORI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1405 *Mycoplasma genitalium* MG184 MODIFICATION METHYLASE ECORI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2868 *Mycobacterium tuberculosis* Rv3263 MODIFICATION METHYLASE ECO57I (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2933 *Mycobacterium leprae* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2934 *Mycobacterium leprae* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3404 *Mycobacterium leprae* MODIFICATION METHYLASE ECO57I (EC 2\_1\_1\_72)  
 2\_1\_1\_72 3442 *Mycobacterium bovis* MODIFICATION METHYLASE ECO57I (EC 2\_1\_1\_72)  
 2\_1\_1\_72 5748 *Klebsiella pneumoniae* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6704 *Klebsiella pneumoniae* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 6705 *Klebsiella pneumoniae* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 8631 *Klebsiella pneumoniae* ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 30 *Helicobacter pylori* HP0593 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 270 *Helicobacter pylori* HP0850 TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 326 *Helicobacter pylori* HP0910 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 744 *Helicobacter pylori* HP1352 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 759 *Helicobacter pylori* HP1367 MODIFICATION METHYLASE MBOII (EC 2\_1\_1\_72)  
 2\_1\_1\_72 762 *Helicobacter pylori* HP1370 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 792 *Helicobacter pylori* HP1403 TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1010 *Helicobacter pylori* HP0050 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1049 *Helicobacter pylori* HP0092 SITE-SPECIFIC DNA-METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1207 *Helicobacter pylori* HP0260 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 1209 *Helicobacter pylori* HP0262 site-specific DNA-methyltransferase (adenine-specific) (EC 2\_1\_1\_72) (HpaI)

2\_1\_1\_72 1210 *Helicobacter pylori* HP0263 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 1385 *Helicobacter pylori* HP0463 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)

2\_1\_1\_72 1744 *Helicobacter pylori* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 43 *Helicobacter pylori* J99 jhp0043 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 45 *Helicobacter pylori* J99 jhp0045 TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 88 *Helicobacter pylori* J99tr|Q9ZMY0 SITE-SPECIFIC DNA-METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 168 *Helicobacter pylori* J99tr|Q9ZMQ4 MODIFICATION METHYLASE LLA I (EC 2\_1\_1\_72), second component

2\_1\_1\_72 249 *Helicobacter pylori* J99tr|Q9ZMH6 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 251 *Helicobacter pylori* J99tr|Q9ZMH4 site-specific DNA-methyltransferase (adenine-specific) (EC 2\_1\_1\_72) (HpaI)

2\_1\_1\_72 253 *Helicobacter pylori* J99tr|Q9ZMH2 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 754 *Helicobacter pylori* J99 jhp0756 MODIFICATION METHYLASE (EC 2\_1\_1\_72)

2\_1\_1\_72 785 *Helicobacter pylori* J99tr|Q9ZKZ6 TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 843 *Helicobacter pylori* J99tr|Q9ZKT9 DNA ADENINE METHYLASE (EC 2\_1\_1\_72)

2\_1\_1\_72 1258 *Helicobacter pylori* J99tr|Q9ZJN4 ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 1273 *Helicobacter pylori* J99tr|Q9ZJM2 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 1285 *Helicobacter pylori* J99tr|Q9ZJL0 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 1399 *Helicobacter pylori* J99 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 1411 *Helicobacter pylori* J99 hsdM\_3 TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 476 *Haemophilus influenzae* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 477 *Haemophilus influenzae* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 4114 *Haemophilus influenzae* HI0209 ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 4123 *Haemophilus influenzae* HI0215 TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 4125 *Haemophilus influenzae* TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 11594 *Haemophilus influenzae* HI1392 MODIFICATION METHYLASE HINDIII (EC 2\_1\_1\_72)

2\_1\_1\_72 13577 *Haemophilus influenzae* HI0513 MODIFICATION METHYLASE HINCII (EC 2\_1\_1\_72)

2\_1\_1\_72 16045 *Haemophilus influenzae* HI1056 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 544 *Haemophilus ducreyi* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 545 *Haemophilus ducreyi* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 781 *Haemophilus ducreyi* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)

2\_1\_1\_72 1462 *Haemophilus ducreyi* TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 3187 *Escherichia coli* yhdJ ADENINE-SPECIFIC METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 5982 *Escherichia coli* dam ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)

2\_1\_1\_72 6453 *Escherichia coli* hsdM TYPE I RESTRICTION ENZYME ECOK I M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 2709 *Enterococcus faecium* (DOE) MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)

2\_1\_1\_72 3968 *Enterococcus faecium* (DOE) TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)

2\_1\_1\_72 3265 *Enterococcus faecalis* MODIFICATION METHYLASE MUNI (EC 2\_1\_1\_72)

2\_1\_1\_72 1717 *Corynebacterium diphtheriae* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME MOD (EC 2\_1\_1\_72)

2\_1\_1\_72 1464 *Clostridium difficile* MODIFICATION METHYLASE BSTVI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1878 *Clostridium difficile* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 26 *Clostridium acetobutylicum* 790937\_C1\_164 MODIFICATION METHYLASE ECO57I (EC 2\_1\_1\_72)  
 2\_1\_1\_72 201 *Clostridium acetobutylicum* 4105427\_C3\_133 MODIFICATION METHYLASE CVIBI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 1952 *Clostridium acetobutylicum* 25787767\_C2\_40 MODIFICATION METHYLASE BSTVI (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2038 *Campylobacter jejuni* Cj1553c TYPE I RESTRICTION ENZYME ECOR124II M PROTEIN (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2142 *Campylobacter jejuni* Cj0208 MODIFICATION METHYLASE NLAIH (EC 2\_1\_1\_72)  
 2\_1\_1\_72 726 *Bordetella pertussis* EC-ycjD TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI5I ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 9331 *Bordetella bronchiseptica* ADENINE-SPECIFIC DNA METHYLTRANSFERASE (EC 2\_1\_1\_72)  
 2\_1\_1\_72 9387 *Bordetella bronchiseptica* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME MOD (EC 2\_1\_1\_72)  
 2\_1\_1\_72 610 *Bacillus subtilis* ydiS MODIFICATION METHYLASE LLADCHI B (EC 2\_1\_1\_72)  
 2\_1\_1\_72 2942 *Bacillus subtilis* ytxK MODIFICATION METHYLASE ACCI (EC 2\_1\_1\_72)  
 2\_1\_1\_79 4807 *Yersinia pseudotuberculosis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 1131 *Yersinia pestis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 4948 *Vibrio cholerae* El Tor N16961 ORF01465 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2942 *Salmonella typhimurium* cdfA CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 4613 *Salmonella typhi* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 306 *Salmonella paratyphi* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2263 *Salmonella enteritidis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 3698 *Salmonella dublin* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2096 *Pseudomonas aeruginosa* PA5546 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 344 *Mycobacterium tuberculosis* cmaA2 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 2 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2229 *Mycobacterium tuberculosis* mmaA2 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 3365 *Mycobacterium tuberculosis* umaA2 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 3867 *Mycobacterium tuberculosis* Rv3720 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 4969 *Mycobacterium tuberculosis* ufaA1 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 6034 *Mycobacterium tuberculosis* cmaA1 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 342 *Mycobacterium lepraetr*Q49807 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 2 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 1377 *Mycobacterium lepraetr*Q69515 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2413 *Mycobacterium leprae* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 497 *Mycobacterium bovis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 2 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 699 *Mycobacterium bovis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2267 *Mycobacterium bovis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE 1 (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2531 *Mycobacterium bovis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)

2\_1\_1\_79 3540 *Mycobacterium bovis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 3095 *Klebsiella pneumoniae* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 7385 *Klebsiella pneumoniae* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 1351 *Helicobacter pylori* HP0416 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 960 *Helicobacter pylori* J99tr|Q9ZKG8 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 1620 *Escherichia coli* cfa CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 360 *Enterococcus faecium* (DOE) CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2775 *Enterococcus faecalis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 534 *Corynebacterium diphtheriae* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 1603 *Clostridium difficile* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 682 *Clostridium acetobutylicum* 428387\_C2\_97 CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 2480 *Campylobacter jejuni* cfa CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 3532 *Bordetella pertussis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_79 8675 *Bordetella bronchiseptica* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_98 3344 *Saccharomyces cerevisiae* DPH5 DIPHTHINE SYNTHASE (EC 2\_1\_1\_98)  
 2\_1\_2\_11 7188 *Yersinia pseudotuberculosis* EC-panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 4152 *Yersinia pestis* EC-panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 4451 *Vibrio cholerae* El Tor N16961 ORF00814 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2396 *Staphylococcus aureus* EC-panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1986 *Salmonella typhimurium* panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2468 *Salmonella typhi* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 5837 *Salmonella paratyphi* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2878 *Salmonella enteritidis* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2577 *Salmonella dublin* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 3568 *Saccharomyces cerevisiae* ECM31 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2174 *Pseudomonas aeruginosa* panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 8114 *Pseudomonas aeruginosa* PA1598 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 121 *Porphyromonas gingivalis* EC-panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1188 *Neisseria gonorrhoeae* EC-panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1063 *Mycobacterium tuberculosis* panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2306 *Mycobacterium leprae* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)

2\_1\_2\_11 1049 *Mycobacterium bovis* EC-panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1116 *Klebsiella pneumoniae* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE  
 (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1117 *Klebsiella pneumoniae* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE  
 (EC 2\_1\_2\_11)  
 2\_1\_2\_11 462 *Helicobacter pylori* HP1058 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 370 *Helicobacter pylori* J99 panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 4341 *Escherichia coli* panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE  
 (EC 2\_1\_2\_11)  
 2\_1\_2\_11 3269 *Enterococcus faecium* (DOE) 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 1843 *Enterococcus faecalis* EC-panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2137 *Corynebacterium diphtheriae* 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 223 *Clostridium difficile* EC-panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 999 *Clostridium acetobutylicum* 789818\_C3\_54 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2253 *Campylobacter jejuni* panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2759 *Bordetella pertussis* EC-panB 3-METHYL-2-OXOBUTANOATE  
 HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_11 2239 *Bacillus subtilis* panB 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE  
 (EC 2\_1\_2\_11)  
 2\_1\_2\_9 7323 *Yersinia pseudotuberculosis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1464 *Yersinia pestis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 3929 *Vibrio cholerae* El Tor N16961 ORF00080 METHIONYL-TRNA FORMYLTRANSFERASE (EC  
 2\_1\_2\_9)  
 2\_1\_2\_9 602 *Ureaplasma urealyticum* UU463 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 487 *Treponema pallidum* TP0756 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 527 *Streptococcus pyogenes* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 663 *Streptococcus pneumoniae* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 938 *Streptococcus mutans* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 845 *Streptococcus equi* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1181 *Staphylococcus aureus* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 3602 *Salmonella typhimurium* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2597 *Salmonella typhi* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 5949 *Salmonella paratyphi* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 3510 *Salmonella enteritidis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1687 *Salmonella dublin* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 6797 *Saccharomyces cerevisiae* FMT1 MITOCHONDRIAL METHIONYL-TRNA  
 FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 206 *Rickettsia prowazekii* RP209 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1813 *Pseudomonas aeruginosa* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1622 *Porphyromonas gingivalis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1018 *Pasteurella multocida* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1311 *Neisseria gonorrhoeae* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 300 *Mycoplasma pneumoniae* MP299 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2914 *Mycoplasma genitalium* MG365 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 414 *Mycobacterium tuberculosis* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1302 *Mycobacterium tuberculosis* Rv3404c METHIONYL-TRNA FORMYLTRANSFERASE (EC  
 2\_1\_2\_9)  
 2\_1\_2\_9 3496 *Mycobacterium leprae* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2127 *Mycobacterium bovis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 3799 *Mycobacterium bovis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 5241 *Klebsiella pneumoniae* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 542 *Helicobacter pylori* HP1141 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1060 *Helicobacter pylori* J99spIQ9ZK72 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)



2\_1\_2\_9 1357 *Haemophilus influenzae* HI0623 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1223 *Haemophilus ducreyi* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 3206 *Escherichia coli* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1293 *Enterococcus faecium* (DOE) METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 842 *Enterococcus faecalis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 989 *Corynebacterium diphtheriae* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 126 *Clostridium difficile* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2938 *Clostridium acetobutylicum* 4884450\_F1\_2 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 504 *Chlamydia trachomatis* D/UW-3/Cx fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 98 *Chlamydia pneumoniae* AR39 CP0098 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 597 *Chlamydia pneumoniae* CWL029 fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1244 *Campylobacter jejuni* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 668 *Borrelia burgdorferi* BB0064 METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1608 *Bordetella pertussis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2808 *Bordetella pertussis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 2809 *Bordetella pertussis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 7250 *Bordetella bronchiseptica* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 9326 *Bordetella bronchiseptica* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_2\_9 1573 *Bacillus subtilis* fmt METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_3\_1 72 *Streptococcus equi* BIOTIN CARBOXYL CARRIER PROTEIN OF METHYLMALONYL-COA CARBOXYL-TRANSFERASE (EC 2\_1\_3\_1)  
 2\_1\_3\_1 1817 *Porphyromonas gingivalis* BIOTIN CARBOXYL CARRIER PROTEIN OF METHYLMALONYL-COA CARBOXYL-TRANSFERASE (EC 2\_1\_3\_1)  
 2\_1\_3\_1 2194 *Corynebacterium diphtheriae* BIOTIN CARBOXYL CARRIER PROTEIN OF METHYLMALONYL-COA CARBOXYL-TRANSFERASE (EC 2\_1\_3\_1)  
 2\_1\_3\_1 2196 *Corynebacterium diphtheriae* methylmalonyl-CoA carboxyltransferase 12S subunit (EC 2\_1\_3\_1)  
 2\_1\_3\_1 2197 *Corynebacterium diphtheriae* methylmalonyl-CoA carboxyltransferase 5S subunit (EC 2\_1\_3\_1)  
 2\_1\_3\_5 6612 *Salmonella typhimurium* glxB6 oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 688 *Salmonella typhi* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 5623 *Salmonella paratyphi* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 5624 *Salmonella paratyphi* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 2475 *Salmonella enteritidis* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 4525 *Salmonella dublin* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 4502 *Escherichia coli* b0515 oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_1\_3\_5 314 *Enterococcus faecalis* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_3\_1\_109 6580 *Yersinia pseudotuberculosis* ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 453 *Yersinia pestis* ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 6366 *Vibrio cholerae* El Tor N16961 ORF03310 ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 6168 *Salmonella typhimurium* astA ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 1811 *Salmonella typhi* ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 738 *Salmonella paratyphi* ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 1398 *Salmonella paratyphi* ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 1895 *Salmonella enteritidis* ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 4572 *Salmonella dublin* ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 4655 *Pseudomonas aeruginosa* aruG ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 7152 *Pseudomonas aeruginosa* aruF ARGININE N-SUCCINYLTRANSFERASE, ALPHA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_109 1939 *Klebsiella pneumoniae* ARGININE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_109)  
 2\_3\_1\_109 5080 *Escherichia coli* b1747 ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_117 6549 *Yersinia pseudotuberculosis* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)  
 2\_3\_1\_117 1036 *Yersinia pestis* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 6097 *Vibrio cholerae* El Tor N16961 ORF02952 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1292 *Streptococcus pneumoniae* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1526 *Streptococcus mutans* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 3162 *Staphylococcus aureus* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1366 *Salmonella typhimurium* dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 3764 *Salmonella typhi* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 3919 *Salmonella paratyphi* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 3735 *Salmonella enteritidis* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 4235 *Salmonella dublin* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 191 *Rickettsia prowazekii* RPI94 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 5052 *Pseudomonas aeruginosa* dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1593 *Pasteurella multocida* dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1562 *Neisseria gonorrhoeae* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 5089 *Mycobacterium tuberculosis* Rv1201c 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1112 *Mycobacterium leprae* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 2120 *Mycobacterium bovis* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 2495 *Klebsiella pneumoniae* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 2496 *Klebsiella pneumoniae* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 60 *Helicobacter pylori* HP0626 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 571 *Helicobacter pylori* J99tr|Q9ZLK9 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 11175 *Haemophilus influenzae* HI1634 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1480 *Haemophilus ducreyi* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 4362 *Escherichia coli* dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1723 *Enterococcus faecium* (DOE) EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 2182 *Enterococcus faecalis* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1419 *Corynebacterium diphtheriae* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1421 *Corynebacterium diphtheriae* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 1036 *Clostridium difficile* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 3319 *Clostridium acetobutylicum* 3402160\_C2\_8 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 907 *Campylobacter jejuni* dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 824 *Bordetella pertussis* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)

2\_3\_1\_117 9229 *Bordetella bronchiseptica* EC-dapD 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)  
 2\_3\_1\_117 1419 *Bacillus subtilis* ykuQ 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)  
 2\_3\_1\_129 4319 *Yersinia pseudotuberculosis* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 1245 *Yersinia pestis* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 6022 *Vibrio cholerae* El Tor N16961 ORF02846 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 5558 *Salmonella typhimurium* lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 598 *Salmonella typhi* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 990 *Salmonella paratyphi* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 5135 *Salmonella enteritidis* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 7 *Rickettsia prowazekii* RP007 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 1262 *Pseudomonas aeruginosa* lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 347 *Porphyromonas gingivalis* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 60 *Pasteurella multocida* lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 1776 *Neisseria gonorrhoeae* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 3217 *Klebsiella pneumoniae* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 3218 *Klebsiella pneumoniae* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 3219 *Klebsiella pneumoniae* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 767 *Helicobacter pylori* HP1375 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 1278 *Helicobacter pylori* J99tr|Q9ZJL7 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 12390 *Haemophilus influenzae* HI1061 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 672 *Haemophilus ducreyi* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 181 *Escherichia coli* lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 505 *Chlamydia trachomatis* D/UW-3/Cx EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 97 *Chlamydia pneumoniae* AR39 CP0097 ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 598 *Chlamydia pneumoniae* CWL029 EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 2220 *Campylobacter jejuni* lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 4173 *Bordetella pertussis* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_129 7277 *Bordetella bronchiseptica* EC-lpxA ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_15 7483 *Yersinia pseudotuberculosis* EC-plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 2334 *Yersinia pestis* EC-plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 3977 *Vibrio cholerae* El Tor N16961 ORF00140 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)

2\_3\_1\_15 2661 *Salmonella typhimurium* plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 1852 *Salmonella typhi* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 5353 *Salmonella paratyphi* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 5355 *Salmonella paratyphi* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 2805 *Salmonella enteritidis* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 2256 *Salmonella dublin* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 6436 *Pseudomonas aeruginosa* plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 1875 *Pasteurella multocida* plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 1166 *Mycobacterium tuberculosis* plsB1 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 5864 *Mycobacterium tuberculosis* plsB2 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 3562 *Mycobacterium leprae*tr|Q9X7B0 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 443 *Mycobacterium bovis* EC-plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 1452 *Mycobacterium bovis* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 1642 *Mycobacterium bovis* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 9456 *Klebsiella pneumoniae* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 16658 *Haemophilus influenzae* HI0748 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 178 *Haemophilus ducreyi* EC-plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 6292 *Escherichia coli* plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_15 773 *Chlamydia trachomatis* D/UW-3/Cx plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE PRECURSOR (EC 2\_3\_1\_15)  
 2\_3\_1\_15 902 *Chlamydia pneumoniae* AR39 CP0902 GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE PRECURSOR (EC 2\_3\_1\_15)  
 2\_3\_1\_15 885 *Chlamydia pneumoniae* CWL029 plsB GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE PRECURSOR (EC 2\_3\_1\_15)  
 2\_3\_1\_18 3394 *Staphylococcus aureus* BS-yya1 GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 4627 *Salmonella typhi* GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 2130 *Saccharomyces cerevisiae* YJL218W GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 690 *Pseudomonas aeruginosa* PA3853 GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 650 *Pasteurella multocida* BS-yya1 GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 4578 *Mycobacterium tuberculosis* Rv3034c GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 3130 *Mycobacterium leprae* EC-yefH GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 196 *Mycobacterium bovis* EC-yefH GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 4433 *Escherichia coli* lacA GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 5228 *Escherichia coli* yefH GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 5249 *Escherichia coli* b2054 GALACTOSIDE ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 3744 *Enterococcus faecium* (DOE) GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 350 *Enterococcus faecalis* GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 2359 *Enterococcus faecalis* GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 1576 *Corynebacterium diphtheriae* GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_18 1049 *Clostridium acetobutylicum* 6147337\_C3\_51 GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_19 107 *Rickettsia prowazekii* RP109 PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_19 17 *Enterococcus faecalis* BS-yqiS PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_19 3567 *Clostridium difficile* PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_19 1218 *Clostridium acetobutylicum* 36131677\_C2\_51 PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_19 2404 *Bacillus subtilis* yqiS PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_28 6768 *Vibrio cholerae* El Tor N16961ORFA01206 CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 6811 *Vibrio cholerae* El Tor N16961ORFA01266 CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 923 *Salmonella typhi* CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 1103 *Pseudomonas aeruginosa* cat CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)

2\_3\_1\_28 1889 *Pasteurella multocida* vatB CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 1030 *Enterococcus faecium* (DOE) CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 1726 *Clostridium acetobutylicum* 21673217\_FI\_3 CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_28 3096 *Clostridium acetobutylicum* 35187500\_C3\_17 CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_30 6922 *Yersinia pseudotuberculosis* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 272 *Yersinia pestis* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 6397 *Vibrio cholerae* El Tor N16961 ORF03348 SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1081 *Streptococcus pyogenes* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 503 *Streptococcus pneumoniae* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1168 *Streptococcus mutans* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 940 *Streptococcus equi* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1733 *Staphylococcus aureus* BS-yvoF SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 3212 *Staphylococcus aureus* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 341 *Salmonella typhimurium* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 2283 *Salmonella typhi* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 4179 *Salmonella paratyphi* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 864 *Salmonella enteritidis* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 3701 *Salmonella dublin* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 2447 *Pseudomonas aeruginosa* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 117 *Pasteurella multocida* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 384 *Neisseria gonorrhoeae* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1340 *Mycobacterium tuberculosis* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 67 *Mycobacterium leprae* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1573 *Mycobacterium bovis* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 2575 *Klebsiella pneumoniae* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 2576 *Klebsiella pneumoniae* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 608 *Helicobacter pylori* HP1210 SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1124 *Helicobacter pylori* J99 cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 4954 *Haemophilus influenzae* HI0606 SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1507 *Haemophilus ducreyi* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 6097 *Escherichia coli* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 3740 *Enterococcus faecium* (DOE) EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 257 *Enterococcus faecalis* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1721 *Corynebacterium diphtheriae* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1242 *Clostridium difficile* EC-cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1108 *Clostridium acetobutylicum* 3937500\_C3\_62 SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 4002 *Clostridium acetobutylicum* 15720387\_F2\_1 SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 1364 *Campylobacter jejuni* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 3277 *Bordetella pertussis* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 5598 *Bordetella bronchiseptica* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_30 93 *Bacillus subtilis* cysE SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_31 1111 *Staphylococcus aureus* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 3342 *Staphylococcus aureus* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 8123 *Saccharomyces cerevisiae* MET2 HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 4460 *Pseudomonas aeruginosa* metX HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 1687 *Pasteurella multocida* met2 HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 132 *Neisseria gonorrhoeae* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 5137 *Mycobacterium tuberculosis* metA HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 2951 *Mycobacterium leprae* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 2681 *Haemophilus influenzae* HII263 HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 386 *Corynebacterium diphtheriae* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 2189 *Bordetella pertussis* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_31 8298 *Bordetella bronchiseptica* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_35 1663 *Streptococcus mutans* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 2318 *Staphylococcus aureus* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 2352 *Staphylococcus aureus* GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)

2\_3\_1\_35 1665 *Pseudomonas aeruginosa* argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1009 *Neisseria gonorrhoeae* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1431 *Mycobacterium tuberculosis* argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 22 *Mycobacterium leprae* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1854 *Mycobacterium bovis* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1489 *Corynebacterium diphtheriae* GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 476 *Clostridium difficile* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 903 *Clostridium acetobutylicum* 24640635\_F3\_44 GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 904 *Clostridium acetobutylicum* 20884587\_F1\_6 GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1020 *Clostridium acetobutylicum* 6689193\_F1\_5 GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1099 *Bordetella pertussis* BS-argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1100 *Bordetella pertussis* GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_35 1121 *Bacillus subtilis* argJ GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)  
 2\_3\_1\_38 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3- HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]  
 2\_3\_1\_38 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_38 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_41 4420 *Yersinia pseudotuberculosis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4774 *Yersinia pseudotuberculosis* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 6592 *Yersinia pseudotuberculosis* EC-fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 3681 *Yersinia pestis* EC-fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4252 *Yersinia pestis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4583 *Yersinia pestis* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 5814 *Vibrio cholerae* El Tor N16961 ORF02551 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 5818 *Vibrio cholerae* El Tor N16961 ORF02555 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 7687 *Vibrio cholerae* El Tor N16961 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 469 *Streptococcus pyogenes* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1059 *Streptococcus pyogenes* fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1117 *Streptococcus pneumoniae* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1122 *Streptococcus pneumoniae* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1503 *Streptococcus mutans* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1508 *Streptococcus mutans* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 87 *Streptococcus equi* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 240 *Streptococcus equi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1080 *Staphylococcus aureus* BS-yjaX 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2388 *Staphylococcus aureus* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1029 *Salmonella typhimurium* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 3036 *Salmonella typhimurium* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4380 *Salmonella typhimurium* fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1000 *Salmonella typhi* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2361 *Salmonella typhi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4932 *Salmonella typhi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 613 *Salmonella paratyphi* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 999 *Salmonella paratyphi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4122 *Salmonella paratyphi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4123 *Salmonella paratyphi* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2117 *Salmonella enteritidis* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2706 *Salmonella enteritidis* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 3464 *Salmonella enteritidis* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 599 *Salmonella dublin* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2737 *Saccharomyces cerevisiae* FAS2 FATTY ACID SYNTHASE, SUBUNIT ALPHA (EC 2\_3\_1\_86) [INCLUDES: EC 1\_1\_1\_100; EC 2\_3\_1\_41]  
 2\_3\_1\_41 5630 *Saccharomyces cerevisiae* CEM1 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 736 *Rickettsia prowazekii* RP764 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 743 *Rickettsia prowazekii* RP772 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 664 *Pseudomonas aeruginosa* fabH2 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 3002 *Pseudomonas aeruginosa* fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 4137 *Pseudomonas aeruginosa* fabF2 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 5501 *Pseudomonas aeruginosa* fabH1 PUTATIVE 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 6643 *Pseudomonas aeruginosa* fabF1 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 6791 *Pseudomonas aeruginosa* PA3286 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 85 *Porphyromonas gingivalis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 1785 *Porphyromonas gingivalis* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 1188 *Pasteurella multocida* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 1375 *Pasteurella multocida* fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)

2\_3\_1\_41 3 *Neurospora crassa* cem-1 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 465 *Neisseria gonorrhoeae* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 506 *Neisseria gonorrhoeae* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 1825 *Neisseria gonorrhoeae* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 2392 *Neisseria gonorrhoeae* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 3923 *Mycobacterium tuberculosis* kasB 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 5297 *Mycobacterium tuberculosis* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 5817 *Mycobacterium tuberculosis* kasA PUTATIVE 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)

2\_3\_1\_41 221 *Mycobacterium leprae*tr|O69474 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 1795 *Mycobacterium leprae* PUTATIVE 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE 2 (EC 2\_3\_1\_41)

2\_3\_1\_41 1879 *Mycobacterium leprae* PUTATIVE 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE 2 (EC 2\_3\_1\_41)

2\_3\_1\_41 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 1654 *Mycobacterium bovis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]

2\_3\_1\_41 3659 *Mycobacterium bovis* EC-fabF PUTATIVE 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)

2\_3\_1\_41 3660 *Mycobacterium bovis* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 5888 *Klebsiella pneumoniae* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 5889 *Klebsiella pneumoniae* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 5895 *Klebsiella pneumoniae* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 5896 *Klebsiella pneumoniae* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)

2\_3\_1\_41 7848 *Klebsiella pneumoniae* 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)

2\_3\_1\_41 8136 *Klebsiella pneumoniae* 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)



2\_3\_1\_41 1152 *Helicobacter pylori* HP0202 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1471 *Helicobacter pylori* HP0558 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 192 *Helicobacter pylori* J99sp|Q9ZMN0 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 508 *Helicobacter pylori* J99tr|Q9ZLS2 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 15027 *Haemophilus influenzae* HI1533 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 17925 *Haemophilus influenzae* HI0157 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 229 *Haemophilus ducreyi* EC-fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1053 *Escherichia coli* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1057 *Escherichia coli* fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 5416 *Escherichia coli* fabB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2740 *Enterococcus faecium* (DOE) EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2748 *Enterococcus faecium* (DOE) 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 143 *Enterococcus faecalis* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 148 *Enterococcus faecalis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_41 3023 *Clostridium difficile* BS-yjaX 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 3028 *Clostridium difficile* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 59 *Clostridium acetobutylicum* 34642202\_C2\_176 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 64 *Clostridium acetobutylicum* 79802\_C1\_148 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1174 *Clostridium acetobutylicum* 33252318\_F3\_23 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1602 *Clostridium acetobutylicum* 23641963\_C3\_50 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1605 *Clostridium acetobutylicum* 5126892\_C2\_43 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1644 *Clostridium acetobutylicum* 23626967\_C1\_18 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 228 *Chlamydia trachomatis* D/UW-3/Cx EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 739 *Chlamydia trachomatis* D/UW-3/Cx fabF 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I PRECURSOR (EC 2\_3\_1\_41)  
 2\_3\_1\_41 460 *Chlamydia pneumoniae* AR39 CP0460 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 950 *Chlamydia pneumoniae* AR39 CP0950 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I PRECURSOR (EC 2\_3\_1\_41)  
 2\_3\_1\_41 265 *Chlamydia pneumoniae* CWL029 EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 847 *Chlamydia pneumoniae* CWL029 fabF 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I PRECURSOR (EC 2\_3\_1\_41)  
 2\_3\_1\_41 225 *Campylobacter jejuni* fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 2297 *Campylobacter jejuni* fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 749 *Bordetella pertussis* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)

2\_3\_1\_41 753 *Bordetella pertussis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 6994 *Bordetella bronchiseptica* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 8189 *Bordetella bronchiseptica* EC-fabF 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1017 *Bacillus subtilis* yhfB 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1134 *Bacillus subtilis* yjaX 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1135 *Bacillus subtilis* yjaY 3-OXOACYL-(ACYL-CARRIER-PROTEIN) SYNTHASE II (EC 2\_3\_1\_41)  
 2\_3\_1\_41 1712 *Bacillus subtilis* pksF 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE I (EC 2\_3\_1\_41)  
 2\_3\_1\_46 6404 *Yersinia pseudotuberculosis* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 904 *Yersinia pestis* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 5417 *Vibrio cholerae* El Tor N16961 ORF02054 HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 371 *Streptococcus pneumoniae* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 742 *Streptococcus mutans* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 1867 *Salmonella typhimurium* metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 1780 *Salmonella typhi* HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 6226 *Salmonella paratyphi* HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 1741 *Salmonella enteritidis* HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 1171 *Klebsiella pneumoniae* HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 3899 *Escherichia coli* metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 2427 *Clostridium difficile* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 2165 *Clostridium acetobutylicum* 7152132\_C2\_22 HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 1078 *Campylobacter jejuni* metA PROBABLE HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_46 2189 *Bacillus subtilis* metB HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)  
 2\_3\_1\_47 7844 *Yersinia pseudotuberculosis* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 3740 *Yersinia pestis* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 4939 *Vibrio cholerae* El Tor N16961 ORF01456 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1382 *Staphylococcus aureus* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1585 *Salmonella typhimurium* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1586 *Salmonella typhimurium* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 7057 *Salmonella typhimurium* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 4137 *Salmonella typhi* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1701 *Salmonella enteritidis* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1037 *Salmonella dublin* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 3611 *Pseudomonas aeruginosa* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1750 *Porphyromonas gingivalis* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1769 *Porphyromonas gingivalis* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1175 *Pasteurella multocida* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1219 *Neisseria gonorrhoeae* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 93 *Mycobacterium tuberculosis* bioF2 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 5070 *Mycobacterium tuberculosis* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2018 *Mycobacterium leprae* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2019 *Mycobacterium leprae* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2353 *Mycobacterium bovis* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1928 *Klebsiella pneumoniae* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1929 *Klebsiella pneumoniae* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 1931 *Klebsiella pneumoniae* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 34 *Helicobacter pylori* HP0598 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 547 *Helicobacter pylori* J99spJQ9ZLN3 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 11317 *Haemophilus influenzae* HI1553 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 551 *Haemophilus ducreyi* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)

2\_3\_1\_47 743 *Escherichia coli* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2006 *Corynebacterium diphtheriae* 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 746 *Chlamydia trachomatis* D/UW-3/Cx bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 809 *Chlamydia pneumoniae* AR39 CP0809 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 943 *Chlamydia pneumoniae* AR39 CP0943 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 854 *Chlamydia pneumoniae* CWL029 bioF\_1 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 965 *Chlamydia pneumoniae* CWL029 bioF\_2 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2262 *Campylobacter jejuni* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 2211 *Bordetella pertussis* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_47 3016 *Bacillus subtilis* bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)  
 2\_3\_1\_54 6846 *Yersinia pseudotuberculosis* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2742 *Yersinia pestis* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 5662 *Vibrio cholerae* El Tor N16961 ORF02356 FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 700 *Streptococcus pyogenes* pfl FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 716 *Streptococcus pyogenes* pfID FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 223 *Streptococcus pneumoniae* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1016 *Streptococcus pneumoniae* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 898 *Streptococcus mutans* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 568 *Streptococcus equi* EC-pfIB FORMATE ACETYLTRANSFERASE (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1396 *Streptococcus equi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2322 *Staphylococcus aureus* FORMATE ACETYLTRANSFERASE (EC 2\_3\_1\_54)  
 2\_3\_1\_54 3501 *Staphylococcus aureus* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1475 *Salmonella typhimurium* pfID FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 5527 *Salmonella typhimurium* pfl FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 6467 *Salmonella typhimurium* pfIF FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2696 *Salmonella typhi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 4398 *Salmonella typhi* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 65 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 66 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 67 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 68 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 881 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1031 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1635 *Salmonella paratyphi* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2283 *Salmonella enteritidis* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 3765 *Salmonella enteritidis* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 4279 *Salmonella enteritidis* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 927 *Salmonella dublin* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1469 *Salmonella dublin* PUTATIVE FORMATE ACETYLTRANSFERASE 3 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2252 *Salmonella dublin* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 945 *Pasteurella multocida* pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 967 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 969 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2743 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 3477 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 3478 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 8170 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 8171 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 8172 *Klebsiella pneumoniae* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 17889 *Haemophilus influenzae* HI0180 FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 377 *Haemophilus ducreyi* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 4649 *Escherichia coli* b0823 FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 4686 *Escherichia coli* pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1341 *Enterococcus faecium* (DOE) FORMATE ACETYLTRANSFERASE (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1942 *Enterococcus faecalis* EC-pfIB FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 2084 *Corynebacterium diphtheriae* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)

- 2\_3\_1\_54 1860 *Clostridium difficile* FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1861 *Clostridium difficile* EC-pflB FORMATE ACETYLTRANSFERASE (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1670 *Clostridium acetobutylicum* 30110285\_C2\_45 FORMATE ACETYLTRANSFERASE 2 (EC 2\_3\_1\_54)  
 2\_3\_1\_54 1671 *Clostridium acetobutylicum* 24800012\_C1\_39 FORMATE ACETYLTRANSFERASE 1 (EC 2\_3\_1\_54)  
 2\_3\_1\_74 699 *Mycobacterium tuberculosis* pks18 CHALCONE SYNTHASE 2 (EC 2\_3\_1\_74)  
 2\_3\_1\_74 1438 *Mycobacterium tuberculosis* pks10 CHALCONE SYNTHASE (EC 2\_3\_1\_74)  
 2\_3\_1\_74 3530 *Mycobacterium tuberculosis* pks11 CHALCONE SYNTHASE (EC 2\_3\_1\_74)  
 2\_3\_1\_74 94 *Mycobacterium bovis* CHALCONE SYNTHASE 2 (EC 2\_3\_1\_74)  
 2\_3\_1\_74 2158 *Mycobacterium bovis* CHALCONE SYNTHASE (EC 2\_3\_1\_74)  
 2\_3\_1\_74 3839 *Mycobacterium bovis* BS-bcsA CHALCONE SYNTHASE (EC 2\_3\_1\_74)  
 2\_3\_1\_74 2202 *Bacillus subtilis* bcsA CHALCONE SYNTHASE (EC 2\_3\_1\_74)  
 2\_3\_1\_79 7342 *Vibrio cholerae* El Tor N16961ORFA00562 PROBABLE MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 781 *Streptococcus pneumoniae* BS-yyaI MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 3918 *Salmonella typhimurium* maa MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 4806 *Salmonella typhi* MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 109 *Salmonella paratyphi* MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 7109 *Klebsiella pneumoniae* MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 7110 *Klebsiella pneumoniae* MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 4481 *Escherichia coli* b0459 MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 542 *Enterococcus faecium* (DOE) BS-yyaI MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 1290 *Clostridium difficile* BS-yyaI PROBABLE MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_79 4079 *Bacillus subtilis* yyaI MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)  
 2\_3\_1\_8 7412 *Yersinia pseudotuberculosis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 2617 *Yersinia pestis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4923 *Vibrio cholerae* El Tor N16961 ORF01437 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 413 *Treponema pallidum* TP0094 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 316 *Streptococcus pyogenes* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 776 *Streptococcus pneumoniae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1733 *Streptococcus mutans* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 460 *Streptococcus equi* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 2090 *Staphylococcus aureus* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 5413 *Salmonella typhimurium* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 546 *Salmonella typhi* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 3064 *Salmonella paratyphi* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 6866 *Salmonella paratyphi* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 3192 *Salmonella enteritidis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1773 *Salmonella dublin* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4641 *Pseudomonas aeruginosa* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1515 *Porphyromonas gingivalis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 834 *Pasteurella multocida* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 930 *Neisseria gonorrhoeae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 414 *Mycoplasma pneumoniae* MP412 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4524 *Mycoplasma genitalium* MG299 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1814 *Mycobacterium tuberculosis* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1889 *Mycobacterium leprae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 1890 *Mycobacterium leprae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 3697 *Mycobacterium bovis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4499 *Klebsiella pneumoniae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4500 *Klebsiella pneumoniae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 4502 *Klebsiella pneumoniae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 838 *Helicobacter pylori* J99sp|Q9ZKU4 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 12094 *Haemophilus influenzae* H11203 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 971 *Haemophilus ducreyi* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 2246 *Escherichia coli* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 953 *Enterococcus faecium* (DOE) PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 828 *Corynebacterium diphtheriae* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 3354 *Clostridium acetobutylicum* 4886092\_F3\_6 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 85 *Campylobacter jejuni* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)

2\_3\_1\_8 847 *Borrelia burgdorferi* BB0589 PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_8 3760 *Bacillus subtilis* pta PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)  
 2\_3\_1\_81 2161 *Bacillus subtilis* yokD AMINOGLYCOSIDE N3'-ACETYLTRANSFERASE III (EC 2\_3\_1\_81)  
 2\_3\_1\_82 407 *Klebsiella pneumoniae* spP19650 AMINOGLYCOSIDE N6'-ACETYLTRANSFERASE (EC 2\_3\_1\_82)  
 2\_3\_1\_82 416 *Enterococcus faecium* (DOE) AMINOGLYCOSIDE N6'-ACETYLTRANSFERASE (EC 2\_3\_1\_82)  
 2\_3\_1\_82 2785 *Clostridium acetobutylicum* 23602217\_F2\_6 AMINOGLYCOSIDE N6'-ACETYLTRANSFERASE (EC 2\_3\_1\_82)  
 2\_3\_1\_84 7847 *Saccharomyces cerevisiae* ATF2 ALCOHOL O-ACETYLTRANSFERASE 2 (EC 2\_3\_1\_84)  
 2\_3\_1\_84 8272 *Saccharomyces cerevisiae* ATF1 ALCOHOL O-ACETYLTRANSFERASE 1 (EC 2\_3\_1\_84)  
 2\_3\_1\_85 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 1743 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85)  
 2\_3\_1\_85 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 2853 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85)  
 2\_3\_1\_85 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_85 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 2\_3\_1\_86 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3-HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]  
 2\_3\_1\_86 2737 *Saccharomyces cerevisiae* FAS2 FATTY ACID SYNTHASE, SUBUNIT ALPHA (EC 2\_3\_1\_86) [INCLUDES: EC 1\_1\_1\_100; EC 2\_3\_1\_41]  
 2\_3\_1\_86 92 *Pseudomonas aeruginosa* PA5174 FATTY ACID SYNTHASE, SUBUNIT ALPHA (EC 2\_3\_1\_86)  
 2\_3\_1\_88 3462 *Saccharomyces cerevisiae* NAT2 N-TERMINAL ACETYLTRANSFERASE 2 (EC 2\_3\_1\_88)  
 2\_3\_1\_88 5609 *Saccharomyces cerevisiae* NAT1 N-TERMINAL ACETYLTRANSFERASE 1 (EC 2\_3\_1\_88)  
 2\_3\_1\_94 3094 *Bordetella pertussis* ERYTHRONOLIDE SYNTHASE, MODULES 1 AND 2 (EC 2\_3\_1\_94)  
 2\_4\_1\_10 84 *Streptococcus mutans* BS-sacB LEVANSUCRASE PRECURSOR (EC 2\_4\_1\_10)  
 2\_4\_1\_10 1110 *Klebsiella pneumoniae* LEVANSUCRASE PRECURSOR (EC 2\_4\_1\_10)  
 2\_4\_1\_10 3451 *Clostridium acetobutylicum* 12364466\_F3\_5 LEVANSUCRASE PRECURSOR (EC 2\_4\_1\_10)  
 2\_4\_1\_10 4474 *Clostridium acetobutylicum* LEVANSUCRASE (EC 2\_4\_1\_10)  
 2\_4\_1\_10 3440 *Bacillus subtilis* sacB LEVANSUCRASE PRECURSOR (EC 2\_4\_1\_10)  
 2\_4\_1\_109 2513 *Saccharomyces cerevisiae* YDR307W DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 7 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 3585 *Saccharomyces cerevisiae* PMT5 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 5 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 4147 *Saccharomyces cerevisiae* PMT3 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 3 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 4793 *Saccharomyces cerevisiae* PMT1 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 1 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 5147 *Saccharomyces cerevisiae* PMT6 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 6 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 5813 *Saccharomyces cerevisiae* PMT2 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 2 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 6014 *Saccharomyces cerevisiae* PMT4 DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 4 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 20198 *Neurospora crassa* DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 2 (EC 2\_4\_1\_109)  
 2\_4\_1\_109 20217 *Neurospora crassa* DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 3 (EC 2\_4\_1\_109)

2\_4\_1\_12 2745 *Salmonella typhi* CELLULOSE SYNTHASE (EC 2\_4\_1\_12)  
 2\_4\_1\_12 982 *Salmonella paratyphi* CELLULOSE SYNTHASE (EC 2\_4\_1\_12)  
 2\_4\_1\_12 983 *Salmonella paratyphi* CELLULOSE SYNTHASE (EC 2\_4\_1\_12)  
 2\_4\_1\_12 5833 *Klebsiella pneumoniae* CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 7075 *Klebsiella pneumoniae* CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 6065 *Escherichia coli* b3533 CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 2832 *Clostridium difficile* CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 2853 *Clostridium difficile* CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 1822 *Clostridium acetobutylicum* 26367138\_C2\_33 CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 2773 *Clostridium acetobutylicum* 978377\_C3\_22 CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_12 4013 *Clostridium acetobutylicum* 4695965\_C1\_1 CELLULOSE SYNTHASE CATALYTIC SUBUNIT (UDP-FORMING) (EC 2\_4\_1\_12)  
 2\_4\_1\_131 178 *Saccharomyces cerevisiae* KRE2 GLYCOLIPID 2-ALPHA-MANNOSYLTRANSFERASE (EC 2\_4\_1\_131)  
 2\_4\_1\_131 445 *Saccharomyces cerevisiae* KTR7 PROBABLE MANNOSYLTRANSFERASE KTR7 (EC 2\_4\_1\_131)  
 2\_4\_1\_131 470 *Saccharomyces cerevisiae* YUR1 PROBABLE MANNOSYLTRANSFERASE YUR1 (EC 2\_4\_1\_131)  
 2\_4\_1\_131 472 *Saccharomyces cerevisiae* KTR1 GLYCOLIPID 2-ALPHA-MANNOSYLTRANSFERASE (EC 2\_4\_1\_131)  
 2\_4\_1\_131 2228 *Saccharomyces cerevisiae* KTR6 GLYCOLIPID 2-ALPHA-MANNOSYLTRANSFERASE (EC 2\_4\_1\_131)  
 2\_4\_1\_131 4201 *Saccharomyces cerevisiae* KTR2 PROBABLE MANNOSYLTRANSFERASE KTR2 (EC 2\_4\_1\_131)  
 2\_4\_1\_131 4363 *Saccharomyces cerevisiae* KTR4 PROBABLE MANNOSYLTRANSFERASE KTR4 (EC 2\_4\_1\_131)  
 2\_4\_1\_131 5994 *Saccharomyces cerevisiae* KTR3 GLYCOLIPID 2-ALPHA-MANNOSYLTRANSFERASE (EC 2\_4\_1\_131)  
 2\_4\_1\_131 8489 *Saccharomyces cerevisiae* KTR5 PROBABLE MANNOSYLTRANSFERASE KTR5 (EC 2\_4\_1\_131)  
 2\_4\_1\_15 4715 *Salmonella typhimurium* otsA ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 2353 *Salmonella typhi* ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 3275 *Salmonella paratyphi* ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 3277 *Salmonella paratyphi* ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 3888 *Salmonella enteritidis* ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 1883 *Salmonella dublin* ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 524 *Saccharomyces cerevisiae* TSL1 ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 2316 *Saccharomyces cerevisiae* TPS3 ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 8648 *Saccharomyces cerevisiae* TPS1 ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) 56 KD SUBUNIT (EC 2\_4\_1\_15)  
 2\_4\_1\_15 2656 *Mycobacterium tuberculosis* otsA ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) 56 KD SUBUNIT (EC 2\_4\_1\_15)  
 2\_4\_1\_15 1073 *Mycobacterium leprae*trQ50167 ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 3381 *Mycobacterium bovis* EC-otsA ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) 56 KD SUBUNIT (EC 2\_4\_1\_15)

2\_4\_1\_15 2494 *Klebsiella pneumoniae* ALPHA.ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 5166 *Escherichia coli* otsA ALPHA.ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_15 1358 *Corynebacterium diphtheriae* ALPHA.ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)  
 2\_4\_1\_157 1170 *Streptococcus pyogenes* BS-ypjH 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 1524 *Streptococcus pneumoniae* BS-ypjH 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 1550 *Streptococcus mutans* 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 920 *Streptococcus equi* BS-ypjH 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 812 *Staphylococcus aureus* BS-ypfP 1,2-diacylglycerol 3-glucosyltransferase (EC 2\_4\_1\_157) / glucosyldiacylglycerol 6-beta-glucosyltransferase (EC 2\_4\_1\_-)  
 2\_4\_1\_157 2741 *Enterococcus faecium* (DOE) 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 2828 *Enterococcus faecalis* 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)  
 2\_4\_1\_157 362 *Clostridium difficile* BS-ypfP 1,2-diacylglycerol 3-glucosyltransferase (EC 2\_4\_1\_157) / glucosyldiacylglycerol 6-beta-glucosyltransferase (EC 2\_4\_1\_-)  
 2\_4\_1\_157 2045 *Clostridium acetobutylicum* 24647802\_F3\_22 1,2-diacylglycerol 3-glucosyltransferase (EC 2\_4\_1\_157) / glucosyldiacylglycerol 6-beta-glucosyltransferase (EC 2\_4\_1\_-)  
 2\_4\_1\_157 2190 *Bacillus subtilis* ypfP 1,2-diacylglycerol 3-glucosyltransferase (EC 2\_4\_1\_157) / glucosyldiacylglycerol 6-beta-glucosyltransferase (EC 2\_4\_1\_-)  
 2\_4\_1\_16 3550 *Saccharomyces cerevisiae* CHS3 CHITIN SYNTHASE 3 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 4736 *Saccharomyces cerevisiae* CHS1 CHITIN SYNTHASE 1 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 6459 *Saccharomyces cerevisiae* CHS2 CHITIN SYNTHASE 2 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 43 *Neurospora crassa* chs-4 CHITIN SYNTHASE 4 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 106 *Neurospora crassa* chs-2 CHITIN SYNTHASE 2 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 107 *Neurospora crassa* chs-1 CHITIN SYNTHASE 3 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 133 *Neurospora crassa* ncchs3 CHITIN SYNTHASE 1 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 134 *Neurospora crassa* ncchs2 CHITIN SYNTHASE 2 (EC 2\_4\_1\_16)  
 2\_4\_1\_16 20661 *Neurospora crassa* chs-3 CHITIN SYNTHASE 2 (EC 2\_4\_1\_16)  
 2\_4\_1\_182 4488 *Yersinia pseudotuberculosis* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 1246 *Yersinia pestis* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 6021 *Vibrio cholerae* El Tor N16961 ORF02844 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 6755 *Salmonella typhimurium* pgsB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 4760 *Salmonella typhi* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 991 *Salmonella paratyphi* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 3106 *Salmonella enteritidis* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 315 *Rickettsia prowazekii* RP321 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 1264 *Pseudomonas aeruginosa* lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 513 *Porphyromonas gingivalis* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 1717 *Porphyromonas gingivalis* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 59 *Pasteurella multocida* lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 1750 *Neisseria gonorrhoeae* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 3220 *Klebsiella pneumoniae* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 3221 *Klebsiella pneumoniae* LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 287 *Helicobacter pylori* HP0867 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 800 *Helicobacter pylori* J99spJQ9ZKY2 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 12391 *Haemophilus influenzae* HI1060 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 261 *Haemophilus ducreyi* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 182 *Escherichia coli* lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 390 *Chlamydia trachomatis* D/UW-3/Cx EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 895 *Chlamydia pneumoniae* AR39 CP0895 LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 891 *Chlamydia pneumoniae* CWL029 EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)  
 2\_4\_1\_182 2241 *Campylobacter jejuni* lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)



- 2\_4\_1\_182 4172 *Bordetella pertussis* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)
- 2\_4\_1\_182 7276 *Bordetella bronchiseptica* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)
- 2\_4\_1\_19 2204 *Clostridium acetobutylicum* 19539818\_C3\_34 CYCLOMALTODEXTRIN GLUCANOTRANSFERASE (EC 2\_4\_1\_19)
- 2\_4\_1\_20 554 *Clostridium acetobutylicum* 3126303\_C3\_47 CELLOBIOSE-PHOSPHORYLASE (EC 2\_4\_1\_20)
- 2\_4\_1\_21 5634 *Yersinia pseudotuberculosis* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 376 *Yersinia pestis* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 5524 *Vibrio cholerae* El Tor N16961 ORF02202 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 1333 *Streptococcus pneumoniae* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 1419 *Streptococcus mutans* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 1220 *Streptococcus equi* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 1235 *Salmonella typhimurium* glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 687 *Salmonella typhi* GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 4419 *Salmonella paratyphi* GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 4336 *Salmonella enteritidis* GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 5494 *Pseudomonas aeruginosa* PA2165 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 994 *Porphyromonas gingivalis* GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 703 *Pasteurella multocida* glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 5872 *Klebsiella pneumoniae* GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 2863 *Haemophilus influenzae* HI1360 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 6006 *Escherichia coli* glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 632 *Clostridium difficile* EC-glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 1760 *Clostridium acetobutylicum* 3954508\_C2\_45 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 2205 *Clostridium acetobutylicum* 36522177\_C3\_33 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 4012 *Clostridium acetobutylicum* 20522501\_F3\_1 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 764 *Chlamydia trachomatis* D/UW-3/Cx glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 911 *Chlamydia pneumoniae* AR39 CP0911 GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 876 *Chlamydia pneumoniae* CWL029 glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_21 3089 *Bacillus subtilis* glgA GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_25 6960 *Yersinia pseudotuberculosis* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 7618 *Yersinia pseudotuberculosis* EC-glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 374 *Yersinia pestis* EC-glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 3763 *Yersinia pestis* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 6533 *Vibrio cholerae* El Tor N16961ORFA00915 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 797 *Streptococcus pyogenes* malM 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 1571 *Streptococcus pneumoniae* spP29851 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 1396 *Streptococcus mutans* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 1423 *Streptococcus mutans* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 830 *Streptococcus equi* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 1528 *Salmonella typhimurium* glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 3953 *Salmonella typhimurium* malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 6562 *Salmonella typhimurium* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 570 *Salmonella typhi* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 2114 *Salmonella typhi* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 3815 *Salmonella typhi* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_25 1066 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)
- 2\_4\_1\_25 1067 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)
- 2\_4\_1\_25 1068 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)
- 2\_4\_1\_25 2350 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 2351 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)
- 2\_4\_1\_25 3517 *Salmonella paratyphi* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]
- 2\_4\_1\_25 5340 *Salmonella paratyphi* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)



2\_4\_1\_25 5341 *Salmonella paratyphi* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 1532 *Salmonella enteritidis* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 4256 *Salmonella enteritidis* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 4334 *Salmonella enteritidis* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 696 *Pseudomonas aeruginosa* PA2160 GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 3214 *Pseudomonas aeruginosa* PA2163 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 814 *Porphyromonas gingivalis* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 705 *Pasteurella multocida* glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 707 *Pasteurella multocida* malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 1174 *Mycobacterium tuberculosis* glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 4750 *Mycobacterium tuberculosis* Rv1781c 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 1583 *Mycobacterium leprae* EC-glgX GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)  
 2\_4\_1\_25 7 *Mycobacterium bovis* EC-glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 8 *Mycobacterium bovis* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 3070 *Mycobacterium bovis* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 2110 *Klebsiella pneumoniae* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 2111 *Klebsiella pneumoniae* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 5876 *Klebsiella pneumoniae* GLYCOGEN DEBRANCHING ENZYME (EC 2\_4\_1\_25) (EC 3\_2\_1\_33)  
 2\_4\_1\_25 5877 *Klebsiella pneumoniae* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 2861 *Haemophilus influenzae* HI1358 GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 6446 *Haemophilus influenzae* HI1356 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 5996 *Escherichia coli* malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 6483 *Escherichia coli* glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 100 *Corynebacterium diphtheriae* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 1135 *Corynebacterium diphtheriae* 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 39 *Chlamydia trachomatis* D/UW-3/Cx glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 83 *Chlamydia trachomatis* D/UW-3/Cx EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 367 *Chlamydia pneumoniae* AR39 CP0367 GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 431 *Chlamydia pneumoniae* AR39 CP0431 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 293 *Chlamydia pneumoniae* CWL029 EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 351 *Chlamydia pneumoniae* CWL029 glgX GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 573 *Borrelia burgdorferi* BB0166 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)  
 2\_4\_1\_25 1423 *Bordetella pertussis* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 1828 *Bordetella pertussis* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_25 5276 *Bordetella bronchiseptica* GLYCOGEN DEBRANCHING ENZYME [INCLUDES: 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25); AMYLO-1,6-GLUCOSIDASE (EC 3\_2\_1\_33)]  
 2\_4\_1\_33 1699 *Pseudomonas aeruginosa* PA3541 GLUCOSYL TRANSFERASE [probable ALGINATE SYNTHASE (EC 2\_4\_1\_33)]  
 2\_4\_1\_34 982 *Saccharomyces cerevisiae* FKS3 PUTATIVE 1,3-BETA-GLUCAN SYNTHASE COMPONENT (EC 2\_4\_1\_34)  
 2\_4\_1\_34 3766 *Saccharomyces cerevisiae* FKS1 1,3-BETA-GLUCAN SYNTHASE COMPONENT GLS1 (EC 2\_4\_1\_34)  
 2\_4\_1\_34 6069 *Saccharomyces cerevisiae* GSC2 1,3-BETA-GLUCAN SYNTHASE COMPONENT GLS2 (EC 2\_4\_1\_34)

- 2\_4\_1\_34 29 *Neurospora crassa* gs-1 GLUCAN SYNTHASE (EC 2\_4\_1\_34)
- 2\_4\_1\_44 629 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 631 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 633 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 634 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 635 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 1719 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 778 *Salmonella typhimurium* waaI LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 5906 *Salmonella paratyphi* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 2556 *Salmonella enteritidis* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 2684 *Salmonella dublin* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_44 6110 *Escherichia coli* rfaI LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_5 218 *Streptococcus pneumoniae* GLUCOSYLTRANSFERASE-S (EC 2\_4\_1\_5)
- 2\_4\_1\_5 90 *Streptococcus mutans* GLUCOSYLTRANSFERASE-S (EC 2\_4\_1\_5)
- 2\_4\_1\_5 2102 *Streptococcus mutans* GLUCOSYLTRANSFERASE-SI PRECURSOR (EC 2\_4\_1\_5)
- 2\_4\_1\_5 1269 *Escherichia coli* b1309 GLUCOSYLTRANSFERASE-S (EC 2\_4\_1\_5)
- 2\_4\_1\_5 2102 *Enterococcus faecium* (DOE) GLUCOSYLTRANSFERASE-S (EC 2\_4\_1\_5)
- 2\_4\_1\_52 642 *Streptococcus pneumoniae* PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 3097 *Staphylococcus aureus* PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 3544 *Staphylococcus aureus* PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 3545 *Staphylococcus aureus* PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 405 *Rickettsia prowazekii* RP414 POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 761 *Porphyromonas gingivalis* POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_52 3568 *Bacillus subtilis* tagE PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)
- 2\_4\_1\_56 782 *Salmonella typhimurium* waaK LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 3150 *Salmonella typhi* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 5902 *Salmonella paratyphi* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 5185 *Salmonella enteritidis* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 3590 *Salmonella dublin* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 453 *Neisseria gonorrhoeae* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 527 *Klebsiella pneumoniae* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 7365 *Klebsiella pneumoniae* LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_56 6106 *Escherichia coli* rfaK LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_58 537 *Streptococcus mutans* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)

2\_4\_1\_58 46 *Salmonella typhimurium* waaJ LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 3147 *Salmonella typhi* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 5905 *Salmonella paratyphi* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 2555 *Salmonella enteritidis* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 2682 *Salmonella dublin* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 465 *Rickettsia prowazekii* RP476 LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 802 *Helicobacter pylori* HPI416 LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 1113 *Helicobacter pylori* HP0159 LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 150 *Helicobacter pylori* J99tr|Q9ZMS1 LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 1299 *Helicobacter pylori* J99tr|Q9ZJJ6 LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_58 6109 *Escherichia coli* rfaJ LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)  
 2\_4\_1\_8 960 *Neisseria gonorrhoeae* BS-yvdK maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 961 *Neisseria gonorrhoeae* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 962 *Neisseria gonorrhoeae* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1306 *Mycobacterium tuberculosis* Rv3401 maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 3388 *Mycobacterium tuberculosis* otsB maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1221 *Mycobacterium leprae*sp|Q49736 maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 470 *Mycobacterium bovis* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 3717 *Mycobacterium bovis* BS-yvdK maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1276 *Escherichia coli* b1316 maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1170 *Enterococcus faecium* (DOE) maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1268 *Enterococcus faecium* (DOE) maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 2097 *Enterococcus faecium* (DOE) maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 2505 *Enterococcus faecium* (DOE) maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 2035 *Enterococcus faecalis* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 2785 *Enterococcus faecalis* BS-yvdK maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 518 *Clostridium difficile* BS-yvdK maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1491 *Clostridium difficile* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 2885 *Clostridium difficile* maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 1041 *Clostridium acetobutylicum* 24610627\_C1\_39 maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_1\_8 3452 *Bacillus subtilis* yvdK maltose phosphorylase (EC 2\_4\_1\_8)  
 2\_4\_2\_17 7517 *Yersinia pseudotuberculosis* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 796 *Yersinia pestis* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 4958 *Vibrio cholerae* El Tor NI6961 ORF01477 ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1159 *Streptococcus mutans* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 2685 *Staphylococcus aureus* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 500 *Salmonella typhimurium* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 693 *Salmonella typhi* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1568 *Salmonella paratyphi* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1569 *Salmonella paratyphi* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 979 *Salmonella enteritidis* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 3214 *Salmonella dublin* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1069 *Saccharomyces cerevisiae* HIS1 ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 462 *Pseudomonas aeruginosa* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1887 *Pasteurella multocida* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 660 *Neisseria gonorrhoeae* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 2452 *Mycobacterium tuberculosis* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 942 *Mycobacterium leprae*sp|Q49776 ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 4048 *Mycobacterium bovis* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 151 *Klebsiella pneumoniae* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 7763 *Klebsiella pneumoniae* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 8270 *Haemophilus influenzae* HI0468 ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1967 *Escherichia coli* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)

2\_4\_2\_17 1608 *Corynebacterium diphtheriae* ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 1143 *Clostridium difficile* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 2130 *Clostridium acetobutylicum* 24398467\_C1\_32 ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 890 *Campylobacter jejuni* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 760 *Bordetella pertussis* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_17 3487 *Bacillus subtilis* hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)  
 2\_4\_2\_18 8101 *Yersinia pseudotuberculosis* EC-ybiB ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2266 *Yersinia pestis* EC-ybiB ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 4998 *Vibrio cholerae* El Tor N16961 ORF01524 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 1505 *Streptococcus pneumoniae* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2016 *Streptococcus mutans* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 3402 *Staphylococcus aureus* trjQ9RL77 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 6440 *Salmonella typhimurium* ybiB ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2088 *Salmonella typhi* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2089 *Salmonella typhi* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 856 *Salmonella paratyphi* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 3795 *Salmonella enteritidis* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 195 *Saccharomyces cerevisiae* TRP4 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 3630 *Pseudomonas aeruginosa* trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 1538 *Pasteurella multocida* trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 966 *Neisseria gonorrhoeae* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 222 *Mycobacterium tuberculosis* trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 513 *Mycobacterium lepraes* O69581 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2676 *Mycobacterium bovis* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 7281 *Klebsiella pneumoniae* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 6521 *Haemophilus influenzae* H11389 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 767 *Escherichia coli* ybiB ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 4844 *Escherichia coli* trpD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 [INCLUDES: GLUTAMINE AMIDOTRANSFERASE; ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)]  
 2\_4\_2\_18 2134 *Corynebacterium diphtheriae* ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2030 *Clostridium acetobutylicum* 5866093\_F2\_4 ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 3235 *Bordetella pertussis* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 7525 *Bordetella bronchiseptica* EC-trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_18 2263 *Bacillus subtilis* trpD ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)  
 2\_4\_2\_2 1031 *Streptococcus pneumoniae* EC-deoA PYRIMIDINE-NUCLEOSIDE PHOSPHORYLASE (EC 2\_4\_2\_2)  
 2\_4\_2\_2 554 *Streptococcus mutans* EC-deoA PYRIMIDINE-NUCLEOSIDE PHOSPHORYLASE (EC 2\_4\_2\_2)  
 2\_4\_2\_2 1320 *Streptococcus equi* EC-deoA PYRIMIDINE-NUCLEOSIDE PHOSPHORYLASE (EC 2\_4\_2\_2)  
 2\_4\_2\_2 3933 *Bacillus subtilis* pdp PYRIMIDINE-NUCLEOSIDE PHOSPHORYLASE (EC 2\_4\_2\_2)  
 2\_4\_2\_21 5062 *Vibrio cholerae* El Tor N16961 ORF01605 NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)

2\_4\_2\_21 327 *Salmonella typhimurium* cobT NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2291 *Salmonella typhi* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2911 *Salmonella enteritidis* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 1160 *Salmonella dublin* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2319 *Pseudomonas aeruginosa* cobU NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 1744 *Porphyromonas gingivalis* EC-cobT NICOTINATE-NUCLEOTIDE--  
 DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 213 *Mycobacterium tuberculosis* cobT NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2383 *Mycobacterium bovis* EC-cobT NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 6281 *Klebsiella pneumoniae* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 6282 *Klebsiella pneumoniae* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 6283 *Klebsiella pneumoniae* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 4769 *Escherichia coli* b1 I21 PUTATIVE NICOTINATE-NUCLEOTIDE--  
 DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 5206 *Escherichia coli* cobT NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 348 *Corynebacterium diphtheriae* NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 935 *Clostridium difficile* EC-cobT NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2142 *Clostridium acetobutylicum* 5259765\_C1\_28 NICOTINATE-NUCLEOTIDE--  
 DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_21 2143 *Clostridium acetobutylicum* 26204702\_C3\_34 NICOTINATE-NUCLEOTIDE--  
 DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)  
 2\_4\_2\_22 6051 *Vibrio cholerae* El Tor N16961 ORF02888 XANTHINE-GUANINE  
 PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 5400 *Salmonella typhimurium* gpt XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 3436 *Salmonella typhi* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 1150 *Salmonella dublin* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 337 *Saccharomyces cerevisiae* XPT1 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE  
 (EC 2\_4\_2\_22)  
 2\_4\_2\_22 45 *Pasteurella multocida* gpt XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 260 *Neisseria gonorrhoeae* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 4318 *Klebsiella pneumoniae* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 162 *Helicobacter pylori* HP0735 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 672 *Helicobacter pylori* J99tr|Q9ZLA8 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE  
 (EC 2\_4\_2\_22)  
 2\_4\_2\_22 13228 *Haemophilus influenzae* HI0674 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE  
 (EC 2\_4\_2\_22)  
 2\_4\_2\_22 20437 *Haemophilus influenzae* HI0692 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE  
 (EC 2\_4\_2\_22)  
 2\_4\_2\_22 422 *Haemophilus ducreyi* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)  
 2\_4\_2\_22 231 *Escherichia coli* gpt XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 843 *Corynebacterium diphtheriae* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_22)

2\_4\_2\_22 183 *Campylobacter jejuni* Cj1370 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 4295 *Bordetella pertussis* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_22 8557 *Bordetella bronchiseptica* XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)  
 2\_4\_2\_36 692 *Vibrio cholerae* El Tor N16961 ORF01870 CHOLERA ENTEROTOXIN, A CHAIN PRECURSOR (NAD(+)-DIPHTHAMIDE ADP- RIBOSYLTRANSFERASE) (EC 2\_4\_2\_36)  
 2\_4\_2\_36 489 *Corynebacterium diphtheriae* DIPHTheria TOXIN PRECURSOR (EC 2\_4\_2\_36)  
 2\_4\_2\_9 7828 *Yersinia pseudotuberculosis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1816 *Yersinia pestis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 6000 *Vibrio cholerae* El Tor N16961 ORF02816 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 240 *Ureaplasma urealyticum* UU116 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 168 *Treponema pallidum* TP0447 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 169 *Treponema pallidum* TP0448 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 76 *Streptococcus pyogenes* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 167 *Streptococcus pyogenes* pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 860 *Streptococcus pneumoniae* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1691 *Streptococcus pneumoniae* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 912 *Streptococcus mutans* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1913 *Streptococcus mutans* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1154 *Staphylococcus aureus* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1792 *Staphylococcus aureus* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1525 *Salmonella typhimurium* uraP URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 603 *Salmonella typhi* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 4698 *Salmonella paratyphi* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 3669 *Saccharomyces cerevisiae* FUR1 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 453 *Pseudomonas aeruginosa* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 855 *Pseudomonas aeruginosa* pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 454 *Porphyromonas gingivalis* Q9ZNF8 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1099 *Porphyromonas gingivalis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1256 *Pasteurella multocida* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1898 *Pasteurella multocida* pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1421 *Neisseria gonorrhoeae* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 122 *Mycoplasma pneumoniae* MP121 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 4181 *Mycoplasma genitalium* MG030 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 688 *Mycobacterium tuberculosis* pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 4726 *Mycobacterium tuberculosis* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 88 *Mycobacterium bovis* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 3990 *Mycobacterium bovis* P94928 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 8556 *Klebsiella pneumoniae* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 17329 *Haemophilus influenzae* HI0459 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 19316 *Haemophilus influenzae* HI1228 URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 677 *Haemophilus ducreyi* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 680 *Haemophilus ducreyi* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 5507 *Escherichia coli* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 3064 *Enterococcus faecium* (DOE) URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1034 *Enterococcus faecalis* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1799 *Enterococcus faecalis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)

2\_4\_2\_9 880 *Corynebacterium diphtheriae* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) /  
 PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1978 *Corynebacterium diphtheriae* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 156 *Clostridium difficile* BS-pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) /  
 PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 1921 *Clostridium difficile* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1319 *Clostridium acetobutylicum* 24803808\_C1\_38 URACIL PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_9)  
 2\_4\_2\_9 2799 *Clostridium acetobutylicum* 976627\_F2\_10 URACIL PHOSPHORIBOSYLTRANSFERASE (EC  
 2\_4\_2\_9) / PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 2658 *Campylobacter jejuni* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 747 *Bordetella pertussis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 4229 *Bordetella pertussis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 5956 *Bordetella bronchiseptica* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_4\_2\_9 1548 *Bacillus subtilis* pyrR URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9) /  
 PYRIMIDINE OPERON REGULATORY PROTEIN PYRR  
 2\_4\_2\_9 3684 *Bacillus subtilis* upp URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)  
 2\_5\_1\_15 5500 *Yersinia pseudotuberculosis* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 815 *Yersinia pestis* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 4497 *Vibrio cholerae* El Tor N16961 ORF00866 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 943 *Streptococcus pyogenes* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 609 *Streptococcus pneumoniae* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 84 *Streptococcus equi* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2514 *Staphylococcus aureus* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 3583 *Salmonella typhimurium* dhpS DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 5364 *Salmonella typhi* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 5726 *Salmonella typhi* DIHYDROPTEROATE SYNTHASE TYPE II (EC 2\_5\_1\_15)  
 2\_5\_1\_15 496 *Salmonella paratyphi* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 4782 *Salmonella enteritidis* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 3033 *Pseudomonas aeruginosa* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1799 *Porphyromonas gingivalis* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1454 *Pasteurella multocida* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 801 *Neisseria gonorrhoeae* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2976 *Mycobacterium tuberculosis* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 5083 *Mycobacterium tuberculosis* folP2 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1116 *Mycobacterium leprae* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 3075 *Mycobacterium leprae* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2684 *Mycobacterium bovis* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 3970 *Mycobacterium bovis* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2733 *Klebsiella pneumoniae* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 3194 *Klebsiella pneumoniae* DIHYDROPTEROATE SYNTHASE TYPE I (EC 2\_5\_1\_15)  
 2\_5\_1\_15 6853 *Klebsiella pneumoniae* DIHYDROPTEROATE SYNTHASE TYPE II (EC 2\_5\_1\_15)  
 2\_5\_1\_15 628 *Helicobacter pylori* HP1232 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1143 *Helicobacter pylori* J99tr|Q9ZJZ4 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 6411 *Haemophilus influenzae* HI1336 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 11487 *Haemophilus influenzae* HI1464 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1493 *Haemophilus ducreyi* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 5863 *Escherichia coli* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1281 *Enterococcus faecalis* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 381 *Corynebacterium diphtheriae* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1652 *Corynebacterium diphtheriae* DIHYDROPTEROATE SYNTHASE TYPE I (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2398 *Corynebacterium diphtheriae* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1998 *Clostridium difficile* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 987 *Clostridium acetobutylicum* 4884687\_C3\_64 DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 584 *Chlamydia trachomatis* D/UW-3/Cx folP 2-amino-4-hydroxy-6-hydroxymethyldihydropterin  
 pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1114 *Chlamydia pneumoniae* AR39 CP1114 2-amino-4-hydroxy-6-hydroxymethyldihydropterin  
 pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_5\_1\_15 696 *Chlamydia pneumoniae* CWL029 folP 2-amino-4-hydroxy-6-hydroxymethyldihydropterin  
 pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_5\_1\_15 1409 *Campylobacter jejuni* folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 2678 *Bordetella pertussis* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)



2\_5\_1\_15 6546 *Bordetella bronchiseptica* EC-folP DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_15 77 *Bacillus subtilis* sul DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)  
 2\_5\_1\_17 6704 *Yersinia pseudotuberculosis* EC-btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 2576 *Yersinia pestis* EC-btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 4867 *Vibrio cholerae* El Tor N16961 ORF01371 COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 306 *Salmonella typhimurium* cobA COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1075 *Salmonella typhimurium* eutT ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 698 *Salmonella typhi* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1258 *Salmonella typhi* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1070 *Salmonella paratyphi* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1071 *Salmonella paratyphi* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 2894 *Salmonella paratyphi* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 3626 *Salmonella enteritidis* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 4017 *Salmonella enteritidis* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 4207 *Salmonella dublin* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 6630 *Pseudomonas aeruginosa* cobO COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1818 *Mycobacterium tuberculosis* cobA COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 3733 *Mycobacterium leprae* EC-btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 1107 *Mycobacterium bovis* EC-btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 6045 *Klebsiella pneumoniae* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 6046 *Klebsiella pneumoniae* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 8098 *Klebsiella pneumoniae* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 4847 *Escherichia coli* btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 5490 *Escherichia coli* b2459 ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 2216 *Corynebacterium diphtheriae* COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_17 2073 *Clostridium difficile* ETHANOLAMINE UTILIZATION COBALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)  
 2\_5\_1\_19 5267 *Yersinia pseudotuberculosis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2527 *Yersinia pestis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 5530 *Vibrio cholerae* El Tor N16961 ORF02208 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1368 *Streptococcus pyogenes* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 390 *Streptococcus pneumoniae* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 563 *Streptococcus mutans* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 800 *Streptococcus equi* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 3316 *Staphylococcus aureus* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 814 *Salmonella typhimurium* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 3547 *Salmonella typhi* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 3162 *Salmonella paratyphi* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 66 *Salmonella enteritidis* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1912 *Salmonella dublin* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)



2\_5\_1\_19 7406 *Pseudomonas aeruginosa* PA3164 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1640 *Porphyromonas gingivalis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 275 *Pasteurella multocida* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 102 *Neisseria gonorrhoeae* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2160 *Mycobacterium tuberculosis* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2587 *Mycobacterium leprae* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1650 *Mycobacterium bovis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 561 *Klebsiella pneumoniae* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1880 *Klebsiella pneumoniae* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1338 *Helicobacter pylori* HP0401 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 971 *Helicobacter pylori* J99sp|Q9ZKF7 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 10560 *Haemophilus influenzae* HI1589 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 919 *Haemophilus ducreyi* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 874 *Escherichia coli* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2435 *Enterococcus faecium* (DOE) 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2192 *Enterococcus faecalis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2439 *Corynebacterium diphtheriae* 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2419 *Clostridium difficile* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1753 *Clostridium acetobutylicum* 29493752\_F2\_9 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 348 *Chlamydia trachomatis* D/UW-3/Cx EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 813 *Chlamydia pneumoniae* AR39 CP0813 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 961 *Chlamydia pneumoniae* CWL029 EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 1296 *Campylobacter jejuni* aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2867 *Bordetella pertussis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 148 *Bordetella bronchiseptica* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_19 2256 *Bacillus subtilis* aroE 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)  
 2\_5\_1\_29 7442 *Yersinia pseudotuberculosis* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) / GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10); GERANYLGERANYL PYROPHOSPHATE SYNTHASE (EC 2\_5\_1\_29)  
 2\_5\_1\_29 994 *Yersinia pestis* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) / GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE (EC 2\_5\_1\_29)  
 2\_5\_1\_29 4736 *Vibrio cholerae* El Tor N16961 ORF01181 FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) / GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE (EC 2\_5\_1\_29)

2\_5\_1\_29 546 *Streptococcus pyogenes* fps FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 47 *Streptococcus pneumoniae* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 1447 *Streptococcus mutans* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 1048 *Streptococcus equi* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 5131 *Salmonella typhimurium* ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10); GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 3298 *Salmonella typhi* FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 3985 *Salmonella enteritidis* FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10); GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 6663 *Pseudomonas aeruginosa* ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 714 *Pasteurella multocida* ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 38 *Neurospora crassa* al-3 DIMETHYLLALLYLTRANSFERASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / FARNESYLTRANSTRANSFERASE (EC 2\_5\_1\_29)  
 2\_5\_1\_29 10285 *Haemophilus influenzae* HI1438 FARNESYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_1) / GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10); GERANYLGERANYL PYROPHOSPHATE  
 SYNTHASE (EC 2\_5\_1\_29)  
 2\_5\_1\_29 6 *Haemophilus ducreyi* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 4463 *Escherichia coli* ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 3050 *Clostridium difficile* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_29 2423 *Bacillus subtilis* yqiD FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1) /  
 GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10) / GERANYLGERANYL PYROPHOSPHATE SYNTHASE  
 (EC 2\_5\_1\_29)  
 2\_5\_1\_3 8137 *Yersinia pseudotuberculosis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3)  
 2\_5\_1\_3 1984 *Yersinia pestis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 3946 *Vibrio cholerae* El Tor N16961 ORF00103 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE  
 (EC 2\_5\_1\_3)  
 2\_5\_1\_3 909 *Streptococcus pneumoniae* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3)  
 2\_5\_1\_3 915 *Streptococcus pneumoniae* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1602 *Streptococcus mutans* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 3974 *Salmonella typhimurium* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 2949 *Salmonella typhi* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 176 *Salmonella paratyphi* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 7020 *Salmonella paratyphi* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 6728 *Saccharomyces cerevisiae* THI6 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3) / HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_5\_1\_3 276 *Pseudomonas aeruginosa* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)

2\_5\_1\_3 7953 *Pseudomonas aeruginosa* PA4400 MUTATOR MUTT PROTEIN (7,8-DIHYDRO-8-  
 OXOGUANINE-TRIPHOSPHATASE) (8-OXO-DGTPASE) (EC 3\_6\_1\_-) / THIAMIN-PHOSPHATE  
 PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1259 *Porphyromonas gingivalis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3) / PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE  
 KINASE (EC 2\_7\_1\_49) / THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 200 *Pasteurella multocida* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 867 *Neisseria gonorrhoeae* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1786 *Mycobacterium tuberculosis* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3)  
 2\_5\_1\_3 2131 *Mycobacterium lepraes* Q9ZBL5 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3)  
 2\_5\_1\_3 4105 *Mycobacterium bovis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 5412 *Klebsiella pneumoniae* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 265 *Helicobacter pylori* HP0843 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 780 *Helicobacter pylori* J99sp|Q9ZL01 PROBABLE THIAMIN-PHOSPHATE  
 PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 8137 *Haemophilus influenzae* HI0417 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3)  
 2\_5\_1\_3 6276 *Escherichia coli* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1444 *Enterococcus faecalis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1774 *Corynebacterium diphtheriae* THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1249 *Clostridium difficile* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 3592 *Clostridium acetobutylicum* 22845252\_C3\_9 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE  
 (EC 2\_5\_1\_3)  
 2\_5\_1\_3 2884 *Campylobacter jejuni* thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 1102 *Bordetella pertussis* MUTATOR MUTT PROTEIN (7,8-DIHYDRO-8-OXOGUANINE-  
 TRIPHOSPHATASE) (8-OXO-DGTPASE) (EC 3\_6\_1\_-) / THIAMIN-PHOSPHATE PYROPHOSPHORYLASE  
 (EC 2\_5\_1\_3)  
 2\_5\_1\_3 3747 *Bordetella pertussis* EC-thiE THIAMIN PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_3 3822 *Bacillus subtilis* thiC THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_5\_1\_30 121 *Enterococcus faecium* (DOE) HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT I (EC  
 2\_5\_1\_30)  
 2\_5\_1\_30 1729 *Enterococcus faecium* (DOE) HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT II  
 (EC 2\_5\_1\_30)  
 2\_5\_1\_30 2154 *Enterococcus faecalis* HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT II (EC  
 2\_5\_1\_30)  
 2\_5\_1\_30 2244 *Enterococcus faecalis* HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT II (EC  
 2\_5\_1\_30)  
 2\_5\_1\_30 2270 *Bacillus subtilis* gerCC HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT II (EC  
 2\_5\_1\_30)  
 2\_5\_1\_31 970 *Yersinia pestis* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 6030 *Vibrio cholerae* El Tor N16961 ORF02856 UNDECAPRENYL PYROPHOSPHATE  
 SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 30 *Treponema pallidum* TP0603 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 303 *Streptococcus pyogenes* uppS UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 232 *Streptococcus pneumoniae* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 486 *Streptococcus mutans* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 2059 *Streptococcus mutans* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 3172 *Staphylococcus aureus* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 3564 *Salmonella typhimurium* rth UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)  
 2\_5\_1\_31 4759 *Salmonella typhi* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 2453 *Salmonella paratyphi* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 3389 *Salmonella enteritidis* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 416 *Rickettsia prowazekii* RP425 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC  
 2\_5\_1\_31)

2\_5\_1\_31 5275 *Pseudomonas aeruginosa* uppS UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 916 *Porphyromonas gingivalis* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 67 *Pasteurella multocida* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1765 *Neisseria gonorrhoeae* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 5921 *Klebsiella pneumoniae* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 617 *Helicobacter pylori* HP1221 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1132 *Helicobacter pylori* J99 jhp1142 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 12669 *Haemophilus influenzae* HI0920 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 665 *Haemophilus ducreyi* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 174 *Escherichia coli* b0174 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1330 *Enterococcus faecalis* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1601 *Corynebacterium diphtheriae* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 2374 *Corynebacterium diphtheriae* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 776 *Clostridium difficile* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1280 *Clostridium difficile* UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 2640 *Clostridium acetobutylicum* 36540678\_C2\_20 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 3328 *Clostridium acetobutylicum* 4556412\_C3\_17 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 430 *Chlamydia trachomatis* D/UW-3/Cx BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 183 *Chlamydia pneumoniae* AR39 CP0183 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 516 *Chlamydia pneumoniae* CWL029 BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 398 *Campylobacter jejuni* uppS UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 613 *Borrelia burgdorferi* BB0120 UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 4122 *Bordetella pertussis* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 5017 *Bordetella bronchiseptica* BS-yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_31 1653 *Bacillus subtilis* yIuA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)  
 2\_5\_1\_7 7299 *Yersinia pseudotuberculosis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 238 *Yersinia pestis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 6271 *Vibrio cholerae* El Tor N16961 ORF03179 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 325 *Treponema pallidum* TP0159 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 361 *Treponema pallidum* TP0029 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 490 *Streptococcus pyogenes* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 1362 *Streptococcus pyogenes* murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 760 *Streptococcus pneumoniae* BS-murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)

2\_5\_1\_7 1652 *Streptococcus pneumoniae* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 709 *Streptococcus mutans* BS-murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 2061 *Streptococcus mutans* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 56 *Streptococcus equi* BS-murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 206 *Streptococcus equi* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 3313 *Staphylococcus aureus* BS-murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 3603 *Staphylococcus aureus* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 4539 *Salmonella typhi* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 491 *Salmonella paratyphi* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 1217 *Salmonella paratyphi* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 4075 *Salmonella enteritidis* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 661 *Salmonella dublin* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 561 *Rickettsia prowazekii* RP579 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 460 *Pseudomonas aeruginosa* murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 260 *Porphyromonas gingivalis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 197 *Pasteurella multocida* murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 287 *Neisseria gonorrhoeae* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 131 *Mycobacterium tuberculosis* murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 1177 *Mycobacterium leprae* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 1664 *Mycobacterium leprae* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 3058 *Mycobacterium bovis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 4924 *Klebsiella pneumoniae* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 4925 *Klebsiella pneumoniae* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 4926 *Klebsiella pneumoniae* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 82 *Helicobacter pylori* HP0648 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 593 *Helicobacter pylori* J99sp|Q9ZL16 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 15999 *Haemophilus influenzae* HI1081 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 1426 *Haemophilus ducreyi* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 5871 *Escherichia coli* murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 111 *Enterococcus faecium* (DOE) UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
2\_5\_1\_7 2389 *Enterococcus faecium* (DOE) UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)

2\_5\_1\_7 217 *Enterococcus faecalis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 321 *Corynebacterium diphtheriae* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 1078 *Clostridium difficile* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 30 *Clostridium acetobutylicum* 976552\_C3\_216 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 1301 *Clostridium acetobutylicum* 29306527\_C1\_48 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 435 *Chlamydia trachomatis* D/UW-3/Cx EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 178 *Chlamydia pneumoniae* AR39 CP0178 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 521 *Chlamydia pneumoniae* CWL029 EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 342 *Campylobacter jejuni* murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 280 *Borrelia burgdorferi* BB0472 UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 759 *Bordetella pertussis* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 1260 *Bordetella pertussis* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 1261 *Bordetella pertussis* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 4984 *Bordetella bronchiseptica* UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 6065 *Bordetella bronchiseptica* BS-murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 3671 *Bacillus subtilis* murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_7 3705 *Bacillus subtilis* murZ UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)  
 2\_5\_1\_8 7219 *Yersinia pseudotuberculosis* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 3691 *Yersinia pestis* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 4221 *Vibrio cholerae* El Tor N16961 ORF00488 TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 589 *Treponema pallidum* TP0637 TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1587 *Streptococcus pyogenes* miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1339 *Streptococcus pneumoniae* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 2169 *Streptococcus mutans* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1027 *Streptococcus equi* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1579 *Staphylococcus aureus* EC-miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 3544 *Salmonella typhimurium* miaA TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 2651 *Salmonella typhi* TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1205 *Salmonella paratyphi* TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1523 *Salmonella enteritidis* TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1766 *Salmonella dublin* TRNA DELTA(2)-ISOPENTENYL PYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)

2\_5\_1\_8 8194 *Saccharomyces cerevisiae* MOD5 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 496 *Rickettsia prowazekii* RP510 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1777 *Pseudomonas aeruginosa* miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 937 *Porphyromonas gingivalis* TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE  
(EC 2\_5\_1\_8)  
2\_5\_1\_8 1205 *Porphyromonas gingivalis* TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 294 *Pasteurella multocida* trpX TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE  
(EC 2\_5\_1\_8)  
2\_5\_1\_8 540 *Neisseria gonorrhoeae* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 3901 *Mycobacterium tuberculosis* Rv2728c TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 3902 *Mycobacterium tuberculosis* miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1322 *Mycobacterium lepraes* P46811 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1323 *Mycobacterium lepraetr* Q49835 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 2935 *Mycobacterium bovis* TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE  
(EC 2\_5\_1\_8)  
2\_5\_1\_8 2936 *Mycobacterium bovis* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 8273 *Klebsiella pneumoniae* TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE  
(EC 2\_5\_1\_8)  
2\_5\_1\_8 801 *Helicobacter pylori* HP1415 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1298 *Helicobacter pylori* J99sp|Q9ZJJ7 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 3806 *Haemophilus influenzae* HI0068 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1173 *Haemophilus ducreyi* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 4054 *Escherichia coli* miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE  
(EC 2\_5\_1\_8)  
2\_5\_1\_8 2544 *Enterococcus faecium* (DOE) TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 2140 *Enterococcus faecalis* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1640 *Corynebacterium diphtheriae* TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1678 *Clostridium difficile* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1244 *Clostridium acetobutylicum* 34181503\_C2\_43 TRNA DELTA(2)-  
ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 2382 *Clostridium acetobutylicum* 4767213\_C3\_35 TRNA DELTA(2)-  
ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 735 *Chlamydia trachomatis* D/UW-3/Cx EC-miaA TRNA DELTA(2)-  
ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 956 *Chlamydia pneumoniae* AR39 CP0956 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 842 *Chlamydia pneumoniae* CWL029 EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 2073 *Campylobacter jejuni* miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 294 *Borrelia burgdorferi* BB0821 TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)  
2\_5\_1\_8 1580 *Bordetella pertussis* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE  
TRANSFERASE (EC 2\_5\_1\_8)

2\_5\_1\_8 5065 *Bordetella bronchiseptica* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_8 1733 *Bacillus subtilis* miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)  
 2\_5\_1\_9 4806 *Yersinia pseudotuberculosis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1132 *Yersinia pestis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2737 *Yersinia pestis* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 6042 *Vibrio cholerae* El Tor N16961 ORF02875 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 6044 *Vibrio cholerae* El Tor N16961 ORF02877 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1206 *Streptococcus pneumoniae* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1208 *Streptococcus pneumoniae* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 835 *Staphylococcus aureus* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2887 *Staphylococcus aureus* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 3128 *Staphylococcus aureus* 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2941 *Salmonella typhimurium* ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 5138 *Salmonella typhimurium* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 4790 *Salmonella typhi* 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 5017 *Salmonella typhi* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 305 *Salmonella paratyphi* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 4746 *Salmonella paratyphi* 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 291 *Salmonella enteritidis* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1460 *Salmonella dublin* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2348 *Salmonella dublin* 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1813 *Saccharomyces cerevisiae* RIB5 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 7708 *Saccharomyces cerevisiae* RIB4 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 489 *Pseudomonas aeruginosa* ribE 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 6657 *Pseudomonas aeruginosa* ribC RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 135 *Porphyromonas gingivalis* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1113 *Porphyromonas gingivalis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 860 *Pasteurella multocida* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1586 *Pasteurella multocida* ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 747 *Neisseria gonorrhoeae* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1703 *Neisseria gonorrhoeae* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 420 *Mycobacterium tuberculosis* ribC RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 424 *Mycobacterium tuberculosis* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2031 *Mycobacterium leprae* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2033 *Mycobacterium leprae* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 4006 *Mycobacterium bovis* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 4010 *Mycobacterium bovis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 3097 *Klebsiella pneumoniae* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 952 *Helicobacter pylori* HP1574 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 968 *Helicobacter pylori* HP0002 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2 *Helicobacter pylori* J99 ribE 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1471 *Helicobacter pylori* J99 ribC RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2772 *Haemophilus influenzae* HI1303 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 10616 *Haemophilus influenzae* HI1613 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 691 *Haemophilus ducreyi* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 693 *Haemophilus ducreyi* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 399 *Escherichia coli* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 5029 *Escherichia coli* ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)



2\_5\_1\_9 993 *Corynebacterium diphtheriae* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 995 *Corynebacterium diphtheriae* 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 3266 *Clostridium difficile* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 3268 *Clostridium difficile* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1403 *Clostridium acetobutylicum* 24647252\_C3\_54 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 1405 *Clostridium acetobutylicum* 1172250\_C1\_43 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 385 *Chlamydia trachomatis* D/UW-3/Cx EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 701 *Chlamydia trachomatis* D/UW-3/Cx EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 220 *Chlamydia pneumoniae* AR39 CP0220 RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 996 *Chlamydia pneumoniae* AR39 CP0996 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 484 *Chlamydia pneumoniae* CWL029 EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 805 *Chlamydia pneumoniae* CWL029 EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2383 *Campylobacter jejuni* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2535 *Campylobacter jejuni* ribA RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2504 *Bordetella pertussis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 3711 *Bordetella pertussis* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 6184 *Bordetella bronchiseptica* RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_5\_1\_9 8923 *Bordetella bronchiseptica* EC-ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2321 *Bacillus subtilis* ribH 6,7-DIMETHYL-8-RIBITYLLUMAZINE SYNTHASE (EC 2\_5\_1\_9)  
 2\_5\_1\_9 2323 *Bacillus subtilis* ribB RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)  
 2\_6\_1\_11 5216 *Yersinia pseudotuberculosis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 5788 *Yersinia pseudotuberculosis* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6856 *Yersinia pseudotuberculosis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 452 *Yersinia pestis* Q9ZC66 ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 525 *Yersinia pestis* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 2463 *Yersinia pestis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6367 *Vibrio cholerae* El Tor NI6961 ORF03311 ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 62 *Streptococcus mutans* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3612 *Staphylococcus aureus* BS-rocD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3670 *Salmonella typhimurium* oat ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3996 *Salmonella typhimurium* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6167 *Salmonella typhimurium* astC ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 704 *Salmonella typhi* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3409 *Salmonella typhi* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 4749 *Salmonella paratyphi* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 4842 *Salmonella paratyphi* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 2433 *Salmonella enteritidis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3336 *Salmonella dublin* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1668 *Saccharomyces cerevisiae* ARG8 ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3260 *Pseudomonas aeruginosa* aruC ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 7663 *Pseudomonas aeruginosa* PA0530 ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1380 *Pasteurella multocida* argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1546 *Neisseria gonorrhoeae* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 5045 *Mycobacterium tuberculosis* argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 24 *Mycobacterium leprae* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1856 *Mycobacterium bovis* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1935 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1936 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1937 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1938 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)

2\_6\_1\_11 2927 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 5561 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 5562 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6213 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6214 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6215 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6348 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 6349 *Klebsiella pneumoniae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 299 *Haemophilus ducreyi* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 2995 *Escherichia coli* ygiG ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 5966 *Escherichia coli* argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1487 *Corynebacterium diphtheriae* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 474 *Clostridium difficile* EC-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 899 *Clostridium acetobutylicum* 23683213\_C2\_73 ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 2153 *Campylobacter jejuni* argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1692 *Bordetella pertussis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3641 *Bordetella pertussis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 3957 *Bordetella pertussis* BS-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 7407 *Bordetella bronchiseptica* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 8202 *Bordetella bronchiseptica* BS-argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 1123 *Bacillus subtilis* argD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_11 4028 *Bacillus subtilis* rocD ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)  
 2\_6\_1\_17 825 *Bordetella pertussis* BS-ykrV N-SUCCINYL-L,L-DAP AMINOTRANSFERASE (EC 2\_6\_1\_17)  
 2\_6\_1\_17 9230 *Bordetella bronchiseptica* BS-ykrV N-SUCCINYL-L,L-DAP AMINOTRANSFERASE (EC 2\_6\_1\_17)  
 2\_6\_1\_18 3304 *Pseudomonas aeruginosa* PA5313 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 4014 *Pseudomonas aeruginosa* PA0299 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 6203 *Pseudomonas aeruginosa* PA0221 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 7365 *Pseudomonas aeruginosa* PA4805 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 8497 *Pseudomonas aeruginosa* PA0132 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 6011 *Mycobacterium tuberculosis* Rv3329 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 2200 *Mycobacterium bovis* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 2201 *Mycobacterium bovis* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 6848 *Klebsiella pneumoniae* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 673 *Bordetella pertussis* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 1386 *Bordetella pertussis* BS-yodT OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 1513 *Bordetella pertussis* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 2489 *Bordetella pertussis* BS-yhxA OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 3028 *Bordetella pertussis* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 5624 *Bordetella bronchiseptica* BS-yodT OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 6206 *Bordetella bronchiseptica* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 6678 *Bordetella bronchiseptica* BS-yhxA OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)

2\_6\_1\_18 7728 *Bordetella bronchiseptica* OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_18 1971 *Bacillus subtilis* yodT OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)  
 2\_6\_1\_21 906 *Staphylococcus aureus* Q9KWZ6 D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 316 *Clostridium acetobutylicum* 24250437\_C2\_113 D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 2816 *Clostridium acetobutylicum* 22664000\_F1\_1 D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 927 *Bordetella pertussis* D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 3565 *Bordetella pertussis* BS-yheM D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 6266 *Bordetella bronchiseptica* D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_21 966 *Bacillus subtilis* yheM D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)  
 2\_6\_1\_36 2852 *Mycobacterium tuberculosis* lat L-LYSINE-EPSILON AMINOTRANSFERASE (EC 2\_6\_1\_36)  
 2\_6\_1\_36 1275 *Mycobacterium leprae* L-LYSINE-EPSILON AMINOTRANSFERASE (EC 2\_6\_1\_36)  
 2\_6\_1\_36 2136 *Mycobacterium leprae* L-LYSINE-EPSILON AMINOTRANSFERASE (EC 2\_6\_1\_36)  
 2\_6\_1\_36 222 *Mycobacterium bovis* L-LYSINE-EPSILON AMINOTRANSFERASE (EC 2\_6\_1\_36)  
 2\_6\_1\_37 7110 *Vibrio cholerae* El Tor N16961ORFA00272 (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 5123 *Salmonella typhimurium* tr[P96060 (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 1625 *Salmonella typhi* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 5023 *Salmonella paratyphi* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 5024 *Salmonella paratyphi* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 1077 *Salmonella dublin* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 465 *Pseudomonas aeruginosa* phnW (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 8360 *Klebsiella pneumoniae* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 8361 *Klebsiella pneumoniae* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 607 *Enterococcus faecium* (DOE) (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_37 1560 *Clostridium difficile* (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)  
 2\_6\_1\_46 7330 *Vibrio cholerae* El Tor N16961ORFA00548 DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)  
 2\_6\_1\_46 6134 *Pseudomonas aeruginosa* PA2413 DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)  
 2\_6\_1\_46 16249 *Haemophilus influenzae* HI0949 DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)  
 2\_6\_1\_46 1184 *Haemophilus ducreyi* DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)  
 2\_6\_1\_46 8892 *Bordetella bronchiseptica* DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)  
 2\_6\_1\_52 5066 *Yersinia pseudotuberculosis* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 2528 *Yersinia pestis* BS-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 4985 *Vibrio cholerae* El Tor N16961 ORF01506 PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 1494 *Streptococcus mutans* BS-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 813 *Salmonella typhimurium* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 3548 *Salmonella typhi* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 3163 *Salmonella paratyphi* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 1350 *Salmonella enteritidis* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 5250 *Saccharomyces cerevisiae* SER1 PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 5704 *Pseudomonas aeruginosa* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 339 *Porphyromonas gingivalis* EC-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 273 *Pasteurella multocida* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 561 *Neisseria gonorrhoeae* EC-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 734 *Mycobacterium tuberculosis* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 2560 *Mycobacterium leprae* BS-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 2707 *Mycobacterium leprae* sp[O33062 PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 1663 *Mycobacterium bovis* BS-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 1879 *Klebsiella pneumoniae* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 19442 *Haemophilus influenzae* HI1167 PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 918 *Haemophilus ducreyi* BS-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 873 *Escherichia coli* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)

2\_6\_1\_52 1484 *Corynebacterium diphtheriae* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 2769 *Campylobacter jejuni* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 196 *Bordetella pertussis* EC-serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 8765 *Bordetella bronchiseptica* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_52 1002 *Bacillus subtilis* serC PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)  
 2\_6\_1\_57 7907 *Yersinia pseudotuberculosis* EC-tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 1614 *Yersinia pestis* EC-tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 7019 *Vibrio cholerae* El Tor N16961ORFA00156 AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 1837 *Salmonella typhimurium* tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 4308 *Salmonella typhi* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 4199 *Salmonella paratyphi* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 4200 *Salmonella paratyphi* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 1048 *Salmonella enteritidis* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 2351 *Salmonella dublin* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 6038 *Pseudomonas aeruginosa* phhC AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 7121 *Pseudomonas aeruginosa* PA3139 AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 451 *Neisseria gonorrhoeae* EC-tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 8455 *Klebsiella pneumoniae* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 3940 *Escherichia coli* tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 607 *Chlamydia trachomatis* D/UW-3/Cx tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 5 *Chlamydia pneumoniae* AR39 CP0005 AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 681 *Chlamydia pneumoniae* CWL029 tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 2070 *Bordetella pertussis* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 4652 *Bordetella pertussis* AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_57 6116 *Bordetella bronchiseptica* EC-tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)  
 2\_6\_1\_62 6402 *Yersinia pseudotuberculosis* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1009 *Yersinia pestis* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 4937 *Vibrio cholerae* El Tor N16961 ORF01453 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2106 *Streptococcus mutans* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1428 *Staphylococcus aureus* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2635 *Staphylococcus aureus* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1581 *Salmonella typhimurium* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 7058 *Salmonella typhimurium* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 3590 *Salmonella typhi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 151 *Salmonella paratyphi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 152 *Salmonella paratyphi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1892 *Salmonella paratyphi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1893 *Salmonella paratyphi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)

2\_6\_1\_62 7017 *Salmonella paratyphi* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 4712 *Salmonella enteritidis* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2737 *Salmonella dublin* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 7638 *Saccharomyces cerevisiae* BIO3 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 7354 *Pseudomonas aeruginosa* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 602 *Porphyromonas gingivalis* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1174 *Pasteurella multocida* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 761 *Neisseria gonorrhoeae* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2622 *Mycobacterium tuberculosis* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 1580 *Mycobacterium leprae*sp|P45488 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 12 *Mycobacterium bovis* BS-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 8931 *Klebsiella pneumoniae* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 388 *Helicobacter pylori* HP0976 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 907 *Helicobacter pylori* J99sp|Q9ZKM5 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 14991 *Haemophilus influenzae* HI1554 ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 550 *Haemophilus ducreyi* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 4623 *Escherichia coli* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 821 *Corynebacterium diphtheriae* ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 3486 *Clostridium acetobutylicum* 25557837\_C2\_9 ADENOSYLMETHIONINE-8-AMINO-7-  
 OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 811 *Chlamydia pneumoniae* AR39 CP0811 ADENOSYLMETHIONINE-8-AMINO-7-  
 OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 963 *Chlamydia pneumoniae* CWL029 EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-  
 OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2263 *Campylobacter jejuni* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 2212 *Bordetella pertussis* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 925 *Bacillus subtilis* yhxA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_62 3017 *Bacillus subtilis* bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE  
 AMINOTRANSFERASE (EC 2\_6\_1\_62)  
 2\_6\_1\_66 5309 *Yersinia pseudotuberculosis* EC-avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC  
 2\_6\_1\_66)  
 2\_6\_1\_66 1252 *Yersinia pestis* EC-avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 3903 *Vibrio cholerae* El Tor N16961 ORF00045 VALINE--PYRUVATE AMINOTRANSFERASE (EC  
 2\_6\_1\_66)  
 2\_6\_1\_66 3160 *Salmonella typhimurium* avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 2826 *Salmonella typhi* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 4522 *Salmonella paratyphi* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 4523 *Salmonella paratyphi* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 2212 *Salmonella enteritidis* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 1392 *Neisseria gonorrhoeae* EC-avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 4696 *Klebsiella pneumoniae* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)

2\_6\_1\_66 4697 *Klebsiella pneumoniae* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 4698 *Klebsiella pneumoniae* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_66 4699 *Klebsiella pneumoniae* VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66).  
 2\_6\_1\_66 3492 *Escherichia coli* avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)  
 2\_6\_1\_9 7519 *Yersinia pseudotuberculosis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 363 *Yersinia pestis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 4960 *Vibrio cholerae* El Tor N16961 ORF01479 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1161 *Streptococcus mutans* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1896 *Staphylococcus aureus* BS-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1910 *Staphylococcus aureus* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2249 *Salmonella typhimurium* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1209 *Salmonella typhi* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1574 *Salmonella paratyphi* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1575 *Salmonella paratyphi* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1576 *Salmonella paratyphi* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1577 *Salmonella paratyphi* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 52 *Salmonella enteritidis* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 3212 *Salmonella dublin* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 6721 *Saccharomyces cerevisiae* HIS5 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 289 *Pseudomonas aeruginosa* hisC1 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 3028 *Pseudomonas aeruginosa* hisC2 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 8442 *Pseudomonas aeruginosa* PA2531 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 171 *Porphyromonas gingivalis* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 502 *Porphyromonas gingivalis* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 274 *Pasteurella multocida* hisH\_1 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1891 *Pasteurella multocida* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 53 *Neisseria gonorrhoeae* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1423 *Mycobacterium tuberculosis* hisC2 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2634 *Mycobacterium tuberculosis* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 717 *Mycobacterium leprae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 718 *Mycobacterium leprae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1688 *Mycobacterium leprae*tr[Q9X7B8 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2854 *Mycobacterium leprae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 151 *Mycobacterium bovis* BS-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2255 *Mycobacterium bovis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2256 *Mycobacterium bovis* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 3964 *Klebsiella pneumoniae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 7759 *Klebsiella pneumoniae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1005 *Haemophilus influenzae* HI0470 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 19443 *Haemophilus influenzae* HI1166 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1969 *Escherichia coli* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 34 *Corynebacterium diphtheriae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 940 *Corynebacterium diphtheriae* HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1144 *Clostridium difficile* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1618 *Clostridium difficile* BS-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 1010 *Clostridium acetobutylicum* 23438750\_F1\_1 HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 712 *Campylobacter jejuni* Cj1436c HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)

2\_6\_1\_9 714 *Campylobacter jejuni* Cj1437c HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2278 *Campylobacter jejuni* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 762 *Bordetella pertussis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 4302 *Bordetella pertussis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 7808 *Bordetella bronchiseptica* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 8129 *Bordetella bronchiseptica* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_6\_1\_9 2258 *Bacillus subtilis* hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)  
 2\_7\_1\_108 6646 *Saccharomyces cerevisiae* SEC59 DOLICHOL KINASE (EC 2\_7\_1\_108)  
 2\_7\_1\_116 7358 *Yersinia pseudotuberculosis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 3774 *Yersinia pestis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 3000 *Salmonella typhimurium* aceK ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 3684 *Salmonella typhi* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 1127 *Salmonella paratyphi* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 3995 *Salmonella enteritidis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 1995 *Salmonella dublin* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 5168 *Pseudomonas aeruginosa* aceK ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 1551 *Klebsiella pneumoniae* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 1552 *Klebsiella pneumoniae* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 3902 *Escherichia coli* aceK ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 2514 *Bordetella pertussis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 2515 *Bordetella pertussis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_116 8094 *Bordetella bronchiseptica* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)  
 2\_7\_1\_12 6601 *Yersinia pseudotuberculosis* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 1566 *Yersinia pestis* GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 5225 *Yersinia pestis* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 1980 *Staphylococcus aureus* BS-gntK GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 3683 *Staphylococcus aureus* GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4248 *Salmonella typhimurium* gntK THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 6203 *Salmonella typhimurium* idnK THERMOSENSITIVE GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 1280 *Salmonella typhi* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 2042 *Salmonella paratyphi* THERMOSENSITIVE GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4319 *Salmonella enteritidis* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4367 *Salmonella enteritidis* THERMOSENSITIVE GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 2229 *Salmonella dublin* THERMOSENSITIVE GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 3972 *Salmonella dublin* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 6201 *Saccharomyces cerevisiae* YDR248C THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 819 *Pseudomonas aeruginosa* PA2321 GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 1653 *Pasteurella multocida* glk THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 1478 *Neisseria gonorrhoeae* EC-gntV THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4658 *Klebsiella pneumoniae* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4152 *Escherichia coli* gntV THERMOSENSITIVE GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 6013 *Escherichia coli* gntK THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 2095 *Enterococcus faecium* (DOE) GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 718 *Corynebacterium diphtheriae* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)  
 2\_7\_1\_12 4000 *Bacillus subtilis* gntK GLUCONOKINASE (EC 2\_7\_1\_12)



2\_7\_1\_130 7622 *Yersinia pseudotuberculosis* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 274 *Yersinia pestis* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 5673 *Vibrio cholerae* El Tor N16961 ORF02370 TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 2426 *Salmonella typhimurium* lpxK TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 2237 *Salmonella typhi* TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 2316 *Salmonella paratyphi* TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 2635 *Salmonella enteritidis* TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 6344 *Pseudomonas aeruginosa* lpxK TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 493 *Porphyromonas gingivalis* EC-ycsH PROBABLE TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 1681 *Pasteurella multocida* lpxK TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 637 *Neisseria gonorrhoeae* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 3001 *Klebsiella pneumoniae* TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 315 *Helicobacter pylori* J99tr[Q9ZMB1] PROBABLE TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 18129 *Haemophilus influenzae* HI0059 TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 1397 *Haemophilus ducreyi* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 881 *Escherichia coli* ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 223 *Chlamydia pneumoniae* AR39 CP0223 TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 417 *Campylobacter jejuni* lpxK PROBABLE TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 2451 *Bordetella pertussis* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_130 6246 *Bordetella bronchiseptica* EC-ycsH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)  
 2\_7\_1\_144 6436 *Yersinia pseudotuberculosis* EC-agaZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3933 *Yersinia pestis* EC-agaZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 422 *Streptococcus pyogenes* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 610 *Streptococcus pyogenes* lacC\_2 TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 137 *Streptococcus pneumoniae* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 1827 *Streptococcus pneumoniae* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 104 *Streptococcus mutans* sp[P26421] TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 542 *Streptococcus equi* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 2822 *Staphylococcus aureus* sp[P11099] TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3849 *Salmonella typhimurium* gatZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3101 *Salmonella typhi* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3102 *Salmonella typhi* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 5803 *Salmonella paratyphi* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 5804 *Salmonella paratyphi* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3676 *Salmonella enteritidis* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 2340 *Klebsiella pneumoniae* TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 3056 *Escherichia coli* agaZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 5275 *Escherichia coli* gatZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 1877 *Enterococcus faecium* (DOE) TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 2226 *Enterococcus faecalis* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 948 *Clostridium difficile* TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 2748 *Clostridium difficile* EC-agaZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_144 1918 *Clostridium acetobutylicum* 667218\_C3\_41 TAGATOSE-6-PHOSPHATE KINASE (EC 2\_7\_1\_144)  
 2\_7\_1\_15 4407 *Yersinia pseudotuberculosis* BS-rbsK RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 5200 *Yersinia pseudotuberculosis* RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 6100 *Yersinia pseudotuberculosis* RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 823 *Yersinia pestis* RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 2459 *Yersinia pestis* EC-rbsK RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 4154 *Yersinia pestis* RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 6650 *Vibrio cholerae* El Tor N16961ORFA01060 RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 1292 *Staphylococcus aureus* EC-rbsK RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 2732 *Staphylococcus aureus* EC-yei1 RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 2192 *Salmonella typhimurium* rbsK RIBOKINASE (EC 2\_7\_1\_15)  
 2\_7\_1\_15 3197 *Salmonella typhimurium* yihV RIBOKINASE (EC 2\_7\_1\_15)



2\_7\_1\_15 4242 *Salmonella typhimurium* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4670 *Salmonella typhimurium* yegV RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5721 *Salmonella typhimurium* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5926 *Salmonella typhimurium*trjQ9Z4S5 TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1069 *Salmonella typhi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1197 *Salmonella typhi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2725 *Salmonella typhi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2943 *Salmonella typhi* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 3827 *Salmonella typhi* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4499 *Salmonella typhi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5780 *Salmonella typhi* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1643 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1645 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2776 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5075 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5765 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5766 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 6196 *Salmonella paratyphi* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 533 *Salmonella enteritidis* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1401 *Salmonella enteritidis* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1870 *Salmonella enteritidis* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4299 *Salmonella enteritidis* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5080 *Salmonella enteritidis* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1069 *Salmonella dublin* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1657 *Salmonella dublin* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 3046 *Salmonella dublin* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4183 *Salmonella dublin* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1932 *Saccharomyces cerevisiae* RBK1 RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 6122 *Pseudomonas aeruginosa* rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 570 *Pasteurella multocida* rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 208 *Mycobacterium tuberculosis* cbhK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1099 *Mycobacterium tuberculosis* rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 501 *Mycobacterium leprae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2389 *Mycobacterium bovis* EC-yhfQ RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4920 *Mycobacterium bovis* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4150 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4151 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4465 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 4466 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 6196 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5317 *Klebsiella pneumoniae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 631 *Helicobacter pylori* J99trjQ9ZLE9 RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 1061 *Haemophilus influenzae* HI0505 RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2048 *Escherichia coli* b2100 RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2109 *Escherichia coli* yeiI RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 3671 *Escherichia coli* rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 3782 *Escherichia coli* yihV RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 5317 *Escherichia coli* yeiC RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2850 *Enterococcus faecium* (DOE) RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 346 *Enterococcus faecalis* EC-rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 2864 *Enterococcus faecalis* TRANSCRIPTIONAL REGULATOR, deoR FAMILY / RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 226 *Corynebacterium diphtheriae* RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 300 *Clostridium difficile* EC-rbsK RIBOKINASE (EC 2\_7\_1\_15)  
2\_7\_1\_15 3587 *Bacillus subtilis* rbsK RIBOKINASE (EC 2\_7\_1\_15)

2\_7\_1\_16 5545 *Yersinia pseudotuberculosis* EC-araB L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 1547 *Yersinia pestis* EC-araB L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 2994 *Staphylococcus aureus* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 294 *Salmonella typhimurium* araB L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 914 *Salmonella typhi* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 277 *Salmonella paratyphi* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 278 *Salmonella paratyphi* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 1715 *Salmonella paratyphi* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 1717 *Salmonella paratyphi* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 3860 *Salmonella enteritidis* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 1565 *Salmonella dublin* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 3785 *Klebsiella pneumoniae* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 3786 *Klebsiella pneumoniae* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 3787 *Klebsiella pneumoniae* L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 4313 *Escherichia coli* araB L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_16 2873 *Bacillus subtilis* araB L-RIBULOKINASE (EC 2\_7\_1\_16)  
 2\_7\_1\_19 4335 *Yersinia pseudotuberculosis* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 3838 *Yersinia pestis* EC-prkB PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 6362 *Vibrio cholerae* El Tor N16961 ORF03306 PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 3992 *Salmonella typhimurium* prkB PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 2429 *Salmonella typhi* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 4848 *Salmonella paratyphi* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 3228 *Salmonella enteritidis* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 2825 *Salmonella dublin* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 5094 *Klebsiella pneumoniae* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_19 6648 *Escherichia coli* prkB PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)  
 2\_7\_1\_2 4784 *Yersinia pseudotuberculosis* EC-yajF GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4792 *Yersinia pseudotuberculosis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 803 *Yersinia pestis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3136 *Yersinia pestis* EC-yajF GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 5283 *Yersinia pestis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4147 *Vibrio cholerae* El Tor N16961 ORF00377 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 5344 *Vibrio cholerae* El Tor N16961 ORF01959 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 992 *Streptococcus pyogenes* EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1023 *Streptococcus pyogenes* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1447 *Streptococcus pyogenes* glcK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 118 *Streptococcus pneumoniae* EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 251 *Streptococcus pneumoniae* EC-yhcI GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1714 *Streptococcus pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 433 *Streptococcus mutans* BS-glcK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 135 *Streptococcus equi* BS-glcK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1164 *Streptococcus equi* EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1697 *Streptococcus equi* EC-yhcI GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1077 *Staphylococcus aureus* BS-glcK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2867 *Staphylococcus aureus* EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2203 *Salmonella typhimurium* yajF GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2258 *Salmonella typhimurium* ycfX GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6072 *Salmonella typhimurium* glk GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6830 *Salmonella typhimurium* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 145 *Salmonella typhi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2302 *Salmonella typhi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2672 *Salmonella typhi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4570 *Salmonella typhi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1020 *Salmonella paratyphi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3472 *Salmonella paratyphi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4638 *Salmonella paratyphi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4639 *Salmonella paratyphi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6986 *Salmonella paratyphi* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1750 *Salmonella enteritidis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1759 *Salmonella enteritidis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3869 *Salmonella enteritidis* GLUCOKINASE (EC 2\_7\_1\_2)

2\_7\_1\_2 3884 *Salmonella enteritidis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3112 *Salmonella dublin* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4919 *Saccharomyces cerevisiae* GLK1 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 4925 *Saccharomyces cerevisiae* YDR516C GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 5785 *Pseudomonas aeruginosa* glk GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1574 *Porphyromonas gingivalis* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1575 *Porphyromonas gingivalis* BS-glK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 51 *Pasteurella multocida* EC-yajF GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1610 *Pasteurella multocida* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 20415 *Neurospora crassa* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 568 *Neisseria gonorrhoeae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 5545 *Mycobacterium tuberculosis* Rv0650 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2100 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2101 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6594 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6595 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6604 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 6605 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 8562 *Klebsiella pneumoniae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 504 *Helicobacter pylori* HP1103 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1019 *Helicobacter pylori* J99tr|Q9ZKB0 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 422 *Haemophilus influenzae* HI0182 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 378 *Escherichia coli* yajF GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1081 *Escherichia coli* b1119 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 5456 *Escherichia coli* glk GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 603 *Enterococcus faecium* (DOE) EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2396 *Enterococcus faecium* (DOE) GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1455 *Enterococcus faecalis* BS-glK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1269 *Corynebacterium diphtheriae* GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3211 *Clostridium difficile* BS-glK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 3719 *Clostridium difficile* EC-nagC GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 495 *Clostridium acetobutylicum* 24806713\_C2\_65 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 1869 *Clostridium acetobutylicum* 20430327\_C2\_32 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 169 *Borrelia burgdorferi* BB0831 GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_2 2480 *Bacillus subtilis* glK GLUCOKINASE (EC 2\_7\_1\_2)  
 2\_7\_1\_26 8052 *Yersinia pseudotuberculosis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 3832 *Yersinia pestis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 493 *Ureaplasma urealyticum* UU355 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 666 *Treponema pallidum* TP0888 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 681 *Streptococcus pyogenes* mreA RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1465 *Streptococcus pneumoniae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1853 *Streptococcus mutans* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 13 *Streptococcus equi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_2)  
 2\_7\_1\_26 2663 *Staphylococcus aureus* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 5767 *Salmonella typhimurium* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 4732 *Salmonella typhi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_2)  
 2\_7\_1\_26 2866 *Salmonella paratyphi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1824 *Saccharomyces cerevisiae* FMN1 MONOFUNCTIONAL RIBOFLAVIN KINASE (EC 2\_7\_1\_26)  
 2\_7\_1\_26 4167 *Pseudomonas aeruginosa* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)

2\_7\_1\_26 1607 *Porphyromonas gingivalis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 767 *Pasteurella multocida* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 334 *Neisseria gonorrhoeae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 674 *Mycoplasma pneumoniae* MP674 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1366 *Mycoplasma genitalium* MG145 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 4232 *Mycobacterium tuberculosis* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 2318 *Mycobacterium leprae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 518 *Mycobacterium bovis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 6239 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 6240 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 6241 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 491 *Helicobacter pylori* HP1087 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 342 *Helicobacter pylori* J99 ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 19847 *Haemophilus influenzae* HI0963 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1444 *Haemophilus ducreyi* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 25 *Escherichia coli* yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_2)  
 2\_7\_1\_26 3670 *Enterococcus faecium* (DOE) EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1322 *Corynebacterium diphtheriae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 2033 *Clostridium difficile* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 3197 *Clostridium acetobutylicum* 2531502\_F2\_4 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 91 *Chlamydia trachomatis* D/UW-3/Cx EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 437 *Chlamydia pneumoniae* AR39 CP0437 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 287 *Chlamydia pneumoniae* CWL029 EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1403 *Campylobacter jejuni* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 974 *Bordetella pertussis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 6588 *Bordetella bronchiseptica* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 1667 *Bacillus subtilis* ribC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_1\_26 2924 *Bacillus subtilis* ribR MONOFUNCTIONAL RIBOFLAVIN KINASE (EC 2\_7\_1\_26)  
 2\_7\_1\_29 5021 *Yersinia pseudotuberculosis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 6227 *Yersinia pseudotuberculosis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 2692 *Yersinia pestis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 2693 *Yersinia pestis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 1209 *Staphylococcus aureus* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 2416 *Staphylococcus aureus* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 4574 *Saccharomyces cerevisiae* DAK1 DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)

2\_7\_1\_29 5059 *Saccharomyces cerevisiae* DAK2 DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 1053 *Pasteurella multocida* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 1054 *Pasteurella multocida* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 3670 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 3671 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 3672 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 5554 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 5555 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 5556 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 5557 *Klebsiella pneumoniae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 4811 *Escherichia coli* b1199 DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 4812 *Escherichia coli* b1200 DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 1935 *Enterococcus faecium* (DOE) DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 1939 *Enterococcus faecium* (DOE) DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 480 *Enterococcus faecalis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 481 *Enterococcus faecalis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 2116 *Corynebacterium diphtheriae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_29 2360 *Corynebacterium diphtheriae* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)  
 2\_7\_1\_31 5010 *Yersinia pseudotuberculosis* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1491 *Yersinia pestis* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 7409 *Vibrio cholerae* El Tor N16961ORFA00642 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 495 *Streptococcus pyogenes* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1335 *Streptococcus pneumoniae* EC-yhaD GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 904 *Streptococcus mutans* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1985 *Staphylococcus aureus* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2791 *Salmonella typhimurium* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 4589 *Salmonella typhimurium* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 6610 *Salmonella typhimurium* glxK GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 653 *Salmonella typhi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1542 *Salmonella typhi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1738 *Salmonella typhi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2144 *Salmonella typhi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3518 *Salmonella paratyphi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3651 *Salmonella paratyphi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 4042 *Salmonella paratyphi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 5621 *Salmonella paratyphi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 6935 *Salmonella paratyphi* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2476 *Salmonella enteritidis* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2779 *Salmonella enteritidis* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3845 *Salmonella enteritidis* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3846 *Salmonella enteritidis* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3092 *Salmonella dublin* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3736 *Salmonella dublin* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 4456 *Salmonella dublin* GLYCERATE KINASE 2 (EC 2\_7\_1\_31)  
 2\_7\_1\_31 4524 *Salmonella dublin* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3144 *Pseudomonas aeruginosa* PA1499 glycerate kinase (EC 2\_7\_1\_31)  
 2\_7\_1\_31 5403 *Pseudomonas aeruginosa* PA1052 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 643 *Porphyromonas gingivalis* EC-yhaD GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1104 *Pasteurella multocida* PM1741 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2209 *Neisseria gonorrhoeae* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 211 *Mycobacterium tuberculosis* Rv2205c GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2385 *Mycobacterium bovis* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2080 *Klebsiella pneumoniae* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3083 *Klebsiella pneumoniae* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 8443 *Klebsiella pneumoniae* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 21688 *Haemophilus influenzae* HI0091 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 497 *Escherichia coli* b0514 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 5839 *Escherichia coli* yhaD GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 2096 *Enterococcus faecium* (DOE) GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 229 *Enterococcus faecalis* EC-yhaD GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 66 *Corynebacterium diphtheriae* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 968 *Clostridium difficile* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)

2\_7\_1\_31 1280 *Clostridium acetobutylicum* 792086\_C3\_57 GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 1039 *Bordetella pertussis* EC-yhaD GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 7594 *Bordetella bronchiseptica* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 7595 *Bordetella bronchiseptica* GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_31 3998 *Bacillus subtilis* yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)  
 2\_7\_1\_33 5823 *Yersinia pseudotuberculosis* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 2180 *Yersinia pestis* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 4195 *Vibrio cholerae* El Tor N16961 ORF00450 PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1295 *Streptococcus pyogenes* coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1874 *Streptococcus pneumoniae* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 542 *Streptococcus mutans* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1247 *Streptococcus equi* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 3263 *Staphylococcus aureus* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1850 *Salmonella typhimurium* panK PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 970 *Salmonella typhi* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 5014 *Salmonella paratyphi* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 766 *Salmonella enteritidis* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 2908 *Salmonella dublin* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 4057 *Saccharomyces cerevisiae* YDR531W PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1110 *Pasteurella multocida* coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 4257 *Mycobacterium tuberculosis* coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 2050 *Mycobacterium leprae* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 2439 *Mycobacterium bovis* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 877 *Klebsiella pneumoniae* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 8696 *Klebsiella pneumoniae* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 13313 *Haemophilus influenzae* HI0631 PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1281 *Haemophilus ducreyi* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 5736 *Escherichia coli* yggC PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 6271 *Escherichia coli* coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 758 *Enterococcus faecalis* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 1600 *Corynebacterium diphtheriae* PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_33 2372 *Bacillus subtilis* yqjS PANTOTHENATE KINASE (EC 2\_7\_1\_33)  
 2\_7\_1\_39 7400 *Yersinia pseudotuberculosis* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 2353 *Yersinia pestis* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 6130 *Vibrio cholerae* El Tor N16961 ORF02992 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1308 *Streptococcus pneumoniae* EC-thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 194 *Streptococcus equi* BS-thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 3759 *Salmonella typhimurium* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 3635 *Salmonella typhi* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 229 *Salmonella paratyphi* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 2631 *Salmonella enteritidis* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 6924 *Saccharomyces cerevisiae* THR1 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1464 *Pseudomonas aeruginosa* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 5146 *Pseudomonas aeruginosa* thrH PHOSPHOSERINE PHOSPHATASE (EC 3\_1\_3\_3) /  
 HOMOSERINE KINASE (2\_7\_1\_39)  
 2\_7\_1\_39 471 *Pasteurella multocida* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1479 *Neisseria gonorrhoeae* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 911 *Mycobacterium tuberculosis* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1198 *Mycobacterium leprae* spP45836 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1565 *Mycobacterium bovis* EC-thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 3562 *Klebsiella pneumoniae* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 454 *Helicobacter pylori* HP1050 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 378 *Helicobacter pylori* J99 thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 18062 *Haemophilus influenzae* HI0088 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 3 *Escherichia coli* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 2511 *Enterococcus faecalis* EC-thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 1381 *Corynebacterium diphtheriae* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 2148 *Clostridium difficile* BS-thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 3245 *Clostridium acetobutylicum* 24111512\_C1\_7 HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 812 *Campylobacter jejuni* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 2958 *Bordetella pertussis* HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_39 8739 *Bordetella bronchiseptica* HOMOSERINE KINASE (EC 2\_7\_1\_39)

2\_7\_1\_39 3219 *Bacillus subtilis* thrB HOMOSERINE KINASE (EC 2\_7\_1\_39)  
 2\_7\_1\_4 7162 *Vibrio cholerae* El Tor N16961ORFA00335 FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 276 *Streptococcus pyogenes* scrK FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 530 *Streptococcus pneumoniae* BS-ydHR FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 130 *Streptococcus mutans* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 828 *Streptococcus equi* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3424 *Staphylococcus aureus* strQ53645 FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 810 *Salmonella typhimurium* scrK FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 2561 *Salmonella typhimurium* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 4596 *Salmonella typhimurium* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 1756 *Salmonella typhi* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 2213 *Salmonella typhi* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3860 *Salmonella paratyphi* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 5795 *Salmonella paratyphi* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3045 *Salmonella enteritidis* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 4234 *Salmonella enteritidis* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 2946 *Salmonella dublin* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3370 *Salmonella dublin* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 4702 *Pseudomonas aeruginosa* mtlZ FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 1123 *Pasteurella multocida* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3115 *Klebsiella pneumoniae* FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3292 *Escherichia coli* yhfQ FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3194 *Enterococcus faecium* (DOE) FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3214 *Enterococcus faecium* (DOE) EC-yhfQ FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 980 *Enterococcus faecalis* BS-ydHR FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 1055 *Clostridium difficile* BS-ydjE FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 129 *Clostridium acetobutylicum* 29851500\_C1\_110 FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 600 *Clostridium acetobutylicum* 23634638\_C1\_43 FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3141 *Clostridium acetobutylicum* 24640686\_C1\_15 FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 586 *Bacillus subtilis* ydHR FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 617 *Bacillus subtilis* ydjE FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_4 3252 *Bacillus subtilis* yurL FRUCTOKINASE (EC 2\_7\_1\_4)  
 2\_7\_1\_45 5998 *Yersinia pseudotuberculosis* EC-kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 1460 *Yersinia pestis* EC-kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 130 *Streptococcus pyogenes* kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 725 *Streptococcus pneumoniae* BS-iolC 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 562 *Streptococcus equi* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 1099 *Streptococcus equi* BS-iolC 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 6836 *Salmonella typhimurium* kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 3360 *Salmonella typhi* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 2278 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 4479 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 3837 *Salmonella enteritidis* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 4177 *Salmonella enteritidis* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 1023 *Salmonella dublin* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 4368 *Salmonella dublin* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 2607 *Pseudomonas aeruginosa* PA2261 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 2319 *Klebsiella pneumoniae* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 5779 *Klebsiella pneumoniae* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 18143 *Haemophilus influenzae* HI0049 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 3446 *Escherichia coli* kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 5091 *Escherichia coli* b1772 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 2270 *Enterococcus faecium* (DOE) 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 80 *Enterococcus faecalis* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 394 *Enterococcus faecalis* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 1305 *Enterococcus faecalis* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 2943 *Clostridium difficile* 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 296 *Clostridium acetobutylicum* 23642213\_C2\_89 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_45 1040 *Clostridium acetobutylicum* 4117142\_F3\_32 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)

2\_7\_1\_45 2208 *Bacillus subtilis* kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)  
 2\_7\_1\_49 5490 *Yersinia pseudotuberculosis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 6974 *Yersinia pseudotuberculosis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 4524 *Yersinia pestis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 5121 *Vibrio cholerae* El Tor N16961 ORF01679 PHOSPHOMETHYLPYRIMIDINE KINASE (EC  
 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 433 *Treponema pallidum* TP0115 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 263 *Streptococcus pyogenes* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 801 *Streptococcus pneumoniae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 908 *Streptococcus pneumoniae* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1284 *Streptococcus mutans* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 619 *Streptococcus equi* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1541 *Staphylococcus aureus* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2178 *Staphylococcus aureus* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 933 *Salmonella typhimurium* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 4597 *Salmonella typhi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1640 *Salmonella paratyphi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1641 *Salmonella paratyphi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 288 *Salmonella enteritidis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2121 *Salmonella dublin* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 3682 *Pseudomonas aeruginosa* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1259 *Porphyromonas gingivalis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3) / PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE  
 KINASE (EC 2\_7\_1\_49) / THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_7\_1\_49 201 *Pasteurella multocida* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1577 *Neisseria gonorrhoeae* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 5000 *Mycobacterium tuberculosis* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1945 *Mycobacterium lepraesp* Q9ZBL1 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2112 *Mycobacterium bovis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 3408 *Klebsiella pneumoniae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 266 *Helicobacter pylori* HP0844 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 781 *Helicobacter pylori* J99sp|Q9ZL00 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 4519 *Haemophilus influenzae* HI0416 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 5280 *Escherichia coli* b2103 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)



2\_7\_1\_49 1180 *Enterococcus faecium* (DOE) PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2536 *Enterococcus faecium* (DOE) PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1443 *Enterococcus faecalis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2776 *Enterococcus faecalis* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2947 *Enterococcus faecalis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1778 *Corynebacterium diphtheriae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1247 *Clostridium difficile* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1374 *Clostridium acetobutylicum* 7235943\_C2\_37 PHOSPHOMETHYLPYRIMIDINE KINASE (EC  
 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 2885 *Campylobacter jejuni* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 108 *Bordetella pertussis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 3746 *Bordetella pertussis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 5606 *Bordetella bronchiseptica* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 7781 *Bordetella bronchiseptica* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 1172 *Bacillus subtilis* yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_49 3795 *Bacillus subtilis* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_1\_5 7798 *Yersinia pseudotuberculosis* EC-rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 410 *Yersinia pestis* EC-rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 1526 *Streptococcus pneumoniae* EC-rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 787 *Salmonella typhimurium* rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 372 *Salmonella typhi* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 5120 *Salmonella paratyphi* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 722 *Salmonella enteritidis* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 2534 *Klebsiella pneumoniae* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 2535 *Klebsiella pneumoniae* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 2536 *Klebsiella pneumoniae* RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 6242 *Escherichia coli* rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 3543 *Enterococcus faecium* (DOE) RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 1297 *Enterococcus faecalis* EC-rhaB RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_5 3114 *Bacillus subtilis* yulC RHAMNUKINASE (EC 2\_7\_1\_5)  
 2\_7\_1\_50 910 *Streptococcus pneumoniae* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 916 *Streptococcus pneumoniae* BS-thiK HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 932 *Salmonella typhimurium* thiM HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 4598 *Salmonella typhi* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1637 *Salmonella paratyphi* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1638 *Salmonella paratyphi* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 2120 *Salmonella dublin* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 6728 *Saccharomyces cerevisiae* THI6 THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC  
 2\_5\_1\_3) / HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 202 *Pasteurella multocida* thiM HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1617 *Klebsiella pneumoniae* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1618 *Klebsiella pneumoniae* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 267 *Helicobacter pylori* HP0845 HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 782 *Helicobacter pylori* J99spjQ9ZKZ9 HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 890 *Haemophilus influenzae* HI0415 HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 5281 *Escherichia coli* b2104 HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1445 *Enterococcus faecalis* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 1248 *Clostridium difficile* BS-thiK HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)

2\_7\_1\_50 1375 *Clostridium acetobutylicum* 23462812\_C1\_30 HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_50 3823 *Bacillus subtilis* thiK HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)  
 2\_7\_1\_51 6863 *Salmonella typhimurium* fucK L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 3854 *Salmonella typhi* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 6002 *Salmonella paratyphi* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 6004 *Salmonella paratyphi* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 2951 *Salmonella enteritidis* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 4976 *Klebsiella pneumoniae* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 4978 *Klebsiella pneumoniae* L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 20633 *Haemophilus influenzae* HI0613 L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_51 2734 *Escherichia coli* fucK L-FUCULOKINASE (EC 2\_7\_1\_51)  
 2\_7\_1\_53 376 *Salmonella paratyphi* CRYPTIC L-XYLULOSE KINASE (EC 2\_7\_1\_53)  
 2\_7\_1\_53 4148 *Klebsiella pneumoniae* CRYPTIC L-XYLULOSE KINASE (EC 2\_7\_1\_53)  
 2\_7\_1\_53 3500 *Escherichia coli* lyxK L-XYLULOSE KINASE (EC 2\_7\_1\_53)  
 2\_7\_1\_55 6308 *Escherichia coli* yjcT D-ALLOSE KINASE (EC 2\_7\_1\_55)  
 2\_7\_1\_56 4389 *Yersinia pseudotuberculosis* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3645 *Yersinia pestis* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 7023 *Vibrio cholerae* El Tor N16961ORFA00161 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1217 *Streptococcus pyogenes* fruB 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 831 *Streptococcus pneumoniae* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1096 *Streptococcus mutans* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1333 *Streptococcus mutans* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 259 *Streptococcus equi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 2625 *Staphylococcus aureus* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 2047 *Salmonella typhimurium* fpk 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3842 *Salmonella typhimurium* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1047 *Salmonella typhi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 4173 *Salmonella typhi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 448 *Salmonella paratyphi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 449 *Salmonella paratyphi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 450 *Salmonella paratyphi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 5799 *Salmonella paratyphi* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 755 *Salmonella enteritidis* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 631 *Pseudomonas aeruginosa* fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3 *Pasteurella multocida* fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 77 *Mycoplasma pneumoniae* MP076 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1190 *Mycoplasma genitalium* MG063 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1892 *Klebsiella pneumoniae* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3832 *Klebsiella pneumoniae* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3833 *Klebsiella pneumoniae* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 13706 *Haemophilus influenzae* HI0447 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 5319 *Escherichia coli* fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 2287 *Enterococcus faecium* (DOE) 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 357 *Enterococcus faecalis* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1888 *Enterococcus faecalis* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 724 *Corynebacterium diphtheriae* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 82 *Clostridium difficile* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 976 *Clostridium difficile* 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 3093 *Clostridium acetobutylicum* 34656317\_F2\_1 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 129 *Borrelia burgdorferi* BB0630 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 401 *Bordetella pertussis* EC-yhfQ 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 6536 *Bordetella bronchiseptica* EC-yhfQ 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_56 1440 *Bacillus subtilis* fruB 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)  
 2\_7\_1\_58 5842 *Salmonella typhimurium* dgoK 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)  
 2\_7\_1\_58 4110 *Salmonella enteritidis* 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)  
 2\_7\_1\_58 3834 *Salmonella dublin* 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)  
 2\_7\_1\_58 7194 *Klebsiella pneumoniae* 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)  
 2\_7\_1\_58 6151 *Escherichia coli* yidV 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)  
 2\_7\_1\_60 56 *Yersinia pestis* EC-yhcI N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 5579 *Vibrio cholerae* El Tor N16961 ORF02263 N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 6108 *Salmonella typhimurium* yhcI N-acetylmannosamine kinase (EC 2\_7\_1\_60)

2\_7\_1\_60 557 *Salmonella typhi* N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 2840 *Salmonella paratyphi* N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 4096 *Salmonella enteritidis* N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 1081 *Pasteurella multocida* EC-yhcI N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 17947 *Haemophilus influenzae* HI0144 N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 5884 *Escherichia coli* yhcI N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_60 1843 *Corynebacterium diphtheriae* UDP-N-acetylglucosamine-2-epimerase (EC 5\_1\_3\_14) /N-acetylmannosamine kinase (EC 2\_7\_1\_60)  
 2\_7\_1\_63 1471 *Mycobacterium tuberculosis* ppgK POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_63 1087 *Mycobacterium lepraespi*Q49988 POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_63 2056 *Mycobacterium leprae* POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_63 825 *Mycobacterium bovis* POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_63 826 *Mycobacterium bovis* EC-yhcI POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_63 890 *Corynebacterium diphtheriae* POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)  
 2\_7\_1\_66 4913 *Yersinia pseudotuberculosis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 3511 *Yersinia pestis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 4392 *Vibrio cholerae* El Tor N16961 ORF00735 BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 1569 *Streptococcus pyogenes* bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 1014 *Streptococcus pneumoniae* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 1404 *Streptococcus mutans* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 1768 *Staphylococcus aureus* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2014 *Salmonella typhimurium* bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 5348 *Salmonella typhi* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2134 *Salmonella paratyphi* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 3075 *Salmonella dublin* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2807 *Pseudomonas aeruginosa* bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 103 *Porphyromonas gingivalis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 182 *Neisseria gonorrhoeae* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2434 *Mycobacterium tuberculosis* Rv2136c BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 957 *Mycobacterium leprae* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2273 *Mycobacterium bovis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 4839 *Klebsiella pneumoniae* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 5813 *Klebsiella pneumoniae* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 5814 *Klebsiella pneumoniae* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 5811 *Escherichia coli* bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2521 *Enterococcus faecium* (DOE) BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2738 *Enterococcus faecalis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 1615 *Corynebacterium diphtheriae* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)

2\_7\_1\_66 2265 *Clostridium difficile* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2285 *Clostridium difficile* BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 378 *Clostridium acetobutylicum* 26777052\_F2\_77 BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 3171 *Clostridium acetobutylicum* 556630\_CI\_9 BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 2134 *Campylobacter jejuni* bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 787 *Borrelia burgdorferi* BB0258 BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 4154 *Bordetella pertussis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 8439 *Bordetella bronchiseptica* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_66 3109 *Bacillus subtilis* yubB BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)  
 2\_7\_1\_69 4239 *Yersinia pseudotuberculosis* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4242 *Yersinia pseudotuberculosis* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4749 *Yersinia pseudotuberculosis* EC-agaV PTS SYSTEM, N-ACETYLGLACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5193 *Yersinia pseudotuberculosis* BS-ypqE PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5259 *Yersinia pseudotuberculosis* EC-ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5597 *Yersinia pseudotuberculosis* EC-fruB PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6037 *Yersinia pseudotuberculosis* EC-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6655 *Yersinia pseudotuberculosis* EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6657 *Yersinia pseudotuberculosis* EC-celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6887 *Yersinia pseudotuberculosis* BS-treP PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7409 *Yersinia pseudotuberculosis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7410 *Yersinia pseudotuberculosis* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7891 *Yersinia pseudotuberculosis* EC-frwD PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7892 *Yersinia pseudotuberculosis* EC-frwB PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 735 *Yersinia pestis* EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 770 *Yersinia pestis* BS-ypqE PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1117 *Yersinia pestis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1150 *Yersinia pestis* EC-frwD PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1151 *Yersinia pestis* EC-frwB PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1279 *Yersinia pestis* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1838 *Yersinia pestis* EC-celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2177 *Yersinia pestis* EC-nagE PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2666 *Yersinia pestis* EC-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3482 *Yersinia pestis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 3483 *Yersinia pestis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3754 *Yersinia pestis* EC-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3931 *Yersinia pestis* EC-agaV PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4116 *Yersinia pestis* BS-treP PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4295 *Yersinia pestis* EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4581 *Yersinia pestis* EC-ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5197 *Yersinia pestis* EC-fruB PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 21 *Vibrio cholerae* El Tor N16961 ORF03202 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 79 *Vibrio cholerae* El Tor N16961 ORF01317 PTS SYSTEM, N-ACETYL GLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4756 *Vibrio cholerae* El Tor N16961 ORF01209 PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4797 *Vibrio cholerae* El Tor N16961 ORF01273 PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5106 *Vibrio cholerae* El Tor N16961 ORF01664 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5108 *Vibrio cholerae* El Tor N16961 ORF01666 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5620 *Vibrio cholerae* El Tor N16961 ORF02308 PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5808 *Vibrio cholerae* El Tor N16961 ORF02543 PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6760 *Vibrio cholerae* El Tor N16961 ORFA01197 PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7022 *Vibrio cholerae* El Tor N16961 ORFA00160 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7024 *Vibrio cholerae* El Tor N16961 ORFA00162 PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7159 *Vibrio cholerae* El Tor N16961 ORFA00332 PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7545 *Vibrio cholerae* El Tor N16961 ORFA00816 PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 368 *Treponema pallidum* TP0038 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 405 *Treponema pallidum* TP0085 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 488 *Treponema pallidum* TP0755 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 50 *Streptococcus pyogenes* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 51 *Streptococcus pyogenes* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 90 *Streptococcus pyogenes* EC-nagE PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 169 *Streptococcus pyogenes* lacE PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 346 *Streptococcus pyogenes* lacF PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 394 *Streptococcus pyogenes* EC-ascF PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 427 *Streptococcus pyogenes* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 507 *Streptococcus pyogenes* EC-treB PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 644 *Streptococcus pyogenes* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 645 *Streptococcus pyogenes* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 718 *Streptococcus pyogenes* EC-celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 719 *Streptococcus pyogenes* EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 842 *Streptococcus pyogenes* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 881 *Streptococcus pyogenes* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 895 *Streptococcus pyogenes* EC-ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 896 *Streptococcus pyogenes* EC-yjft UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1011 *Streptococcus pyogenes* agaV PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1013 *Streptococcus pyogenes* agaF PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1049 *Streptococcus pyogenes* manL PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1087 *Streptococcus pyogenes* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1218 *Streptococcus pyogenes* BS-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1895 *Streptococcus pyogenes* scrA PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 9 *Streptococcus pneumoniae* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 30 *Streptococcus pneumoniae* PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 32 *Streptococcus pneumoniae* BS-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 40 *Streptococcus pneumoniae* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 142 *Streptococcus pneumoniae* PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 143 *Streptococcus pneumoniae* PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 220 *Streptococcus pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 221 *Streptococcus pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 481 *Streptococcus pneumoniae* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 482 *Streptococcus pneumoniae* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 493 *Streptococcus pneumoniae* EC-bglF PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 531 *Streptococcus pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 532 *Streptococcus pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 559 *Streptococcus pneumoniae* EC-treB PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 591 *Streptococcus pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 593 *Streptococcus pneumoniae* BS-licA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 693 *Streptococcus pneumoniae* EC-nagE PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 832 *Streptococcus pneumoniae* EC-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 981 *Streptococcus pneumoniae* EC-malX PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1050 *Streptococcus pneumoniae* EC-ptxA UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1051 *Streptococcus pneumoniae* EC-yjft UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1228 *Streptococcus pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1232 *Streptococcus pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1238 *Streptococcus pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1239 *Streptococcus pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1324 *Streptococcus pneumoniae* EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1430 *Streptococcus pneumoniae* PTS SYSTEM, FRUCTOSE-LIKE-1 IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1431 *Streptococcus pneumoniae* PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1432 *Streptococcus pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1450 *Streptococcus pneumoniae* PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1452 *Streptococcus pneumoniae* PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1529 *Streptococcus pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1530 *Streptococcus pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1583 *Streptococcus pneumoniae* EC-yadI PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1585 *Streptococcus pneumoniae* EC-agaV PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 80 *Streptococcus mutans*sp|P50976 PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 106 *Streptococcus mutans*sp|P26426 PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 120 *Streptococcus mutans*sp|Q02420 PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 133 *Streptococcus mutans*sp|P12655 PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 201 *Streptococcus mutans* EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 779 *Streptococcus mutans* EC-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 844 *Streptococcus mutans*tr|Q9X675 PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 927 *Streptococcus mutans* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1014 *Streptococcus mutans* EC-nagE PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1022 *Streptococcus mutans* EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1032 *Streptococcus mutans* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1094 *Streptococcus mutans* EC-ptsN PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1095 *Streptococcus mutans* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1116 *Streptococcus mutans* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1147 *Streptococcus mutans* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 1148 Streptococcus mutans PTS SYSTEM, FRUCTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1334 Streptococcus mutans BS-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1344 Streptococcus mutans EC-yjIT UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1345 Streptococcus mutans EC-ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1527 Streptococcus mutans strQ9X676 PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1557 Streptococcus mutans EC-treB PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2138 Streptococcus mutans PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 145 Streptococcus equi EC-ascF PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 155 Streptococcus equi BS-treP PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 222 Streptococcus equi PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 223 Streptococcus equi PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 258 Streptococcus equi PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 495 Streptococcus equi PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 496 Streptococcus equi PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 640 Streptococcus equi EC-agaV PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 741 Streptococcus equi EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 765 Streptococcus equi EC-nagE PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1232 Streptococcus equi PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1233 Streptococcus equi PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1283 Streptococcus equi PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1288 Streptococcus equi PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1296 Streptococcus equi EC-ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1297 Streptococcus equi EC-yjIT UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1403 Streptococcus equi EC-celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1404 Streptococcus equi EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1462 Streptococcus equi PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1466 Streptococcus equi UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1659 Streptococcus equi EC-ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1890 Streptococcus equi PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 364 Staphylococcus aureus PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1068 Staphylococcus aureus BS-ybbF PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1157 Staphylococcus aureus EC-glxC PTS SYSTEM, ARBUTIN-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1605 Staphylococcus aureus BS-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1691 Staphylococcus aureus BS-ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT GLCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1943 Staphylococcus aureus PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1971 Staphylococcus aureus UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)



2\_7\_1\_69 1991 *Staphylococcus aureus* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2030 *Staphylococcus aureus* PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2039 *Staphylococcus aureus* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2221 *Staphylococcus aureus* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2267 *Staphylococcus aureus* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2326 *Staphylococcus aureus* BS-treP PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2363 *Staphylococcus aureus* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2659 *Staphylococcus aureus* EC-gatB PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2792 *Staphylococcus aureus* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2824 *Staphylococcus aureus* PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3195 *Staphylococcus aureus* EC-frvB PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3305 *Staphylococcus aureus* EC-ptxA PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3731 *Staphylococcus aureus* EC-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3823 *Staphylococcus aureus* EC-malX PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 336 *Salmonella typhimurium* crr PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 806 *Salmonella typhimurium* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1180 *Salmonella typhimurium* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1242 *Salmonella typhimurium* splP17127 PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1440 *Salmonella typhimurium* pstN PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1687 *Salmonella typhimurium* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1894 *Salmonella typhimurium* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2048 *Salmonella typhimurium* fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2081 *Salmonella typhimurium* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2392 *Salmonella typhimurium* rpoP NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2640 *Salmonella typhimurium* sgaB UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2704 *Salmonella typhimurium* frwB PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3534 *Salmonella typhimurium* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3843 *Salmonella typhimurium* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3846 *Salmonella typhimurium* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3850 *Salmonella typhimurium* gatA PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3851 *Salmonella typhimurium* gatB PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4366 *Salmonella typhimurium* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4367 *Salmonella typhimurium* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 4371 *Salmonella typhimurium* ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4509 *Salmonella typhimurium* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4864 *Salmonella typhimurium* srlE PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4867 *Salmonella typhimurium* gutB PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5213 *Salmonella typhimurium* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5343 *Salmonella typhimurium* yfcC PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5344 *Salmonella typhimurium* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5468 *Salmonella typhimurium* manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5509 *Salmonella typhimurium* treB PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5962 *Salmonella typhimurium* mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6180 *Salmonella typhimurium* celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6184 *Salmonella typhimurium* celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6327 *Salmonella typhimurium* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6328 *Salmonella typhimurium* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6786 *Salmonella typhimurium* ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6787 *Salmonella typhimurium* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6802 *Salmonella typhimurium* frwD PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6977 *Salmonella typhimurium* sgcA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7075 *Salmonella typhimurium* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 329 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 782 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 796 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 814 *Salmonella typhi* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 937 *Salmonella typhi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 938 *Salmonella typhi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 939 *Salmonella typhi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1048 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1815 *Salmonella typhi* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2692 *Salmonella typhi* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2929 *Salmonella typhi* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2975 *Salmonella typhi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2976 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3103 *Salmonella typhi* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3104 *Salmonella typhi* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3222 *Salmonella typhi* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4238 *Salmonella typhi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4599 *Salmonella typhi* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4665 *Salmonella typhi* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 4978 *Salmonella typhi* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5038 *Salmonella typhi* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5151 *Salmonella typhi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5183 *Salmonella typhi* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5184 *Salmonella typhi* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5212 *Salmonella typhi* PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5377 *Salmonella typhi* NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5656 *Salmonella typhi* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5657 *Salmonella typhi* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 16 *Salmonella paratyphi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 422 *Salmonella paratyphi* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 423 *Salmonella paratyphi* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 447 *Salmonella paratyphi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1439 *Salmonella paratyphi* PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1454 *Salmonella paratyphi* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1455 *Salmonella paratyphi* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1873 *Salmonella paratyphi* NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1904 *Salmonella paratyphi* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1905 *Salmonella paratyphi* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1906 *Salmonella paratyphi* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2026 *Salmonella paratyphi* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2295 *Salmonella paratyphi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2297 *Salmonella paratyphi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2298 *Salmonella paratyphi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2299 *Salmonella paratyphi* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2464 *Salmonella paratyphi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3167 *Salmonella paratyphi* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3563 *Salmonella paratyphi* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4712 *Salmonella paratyphi* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4713 *Salmonella paratyphi* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4780 *Salmonella paratyphi* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4782 *Salmonella paratyphi* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4810 *Salmonella paratyphi* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4811 *Salmonella paratyphi* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4946 *Salmonella paratyphi* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5164 *Salmonella paratyphi* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5188 *Salmonella paratyphi* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 5800 *Salmonella paratyphi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5801 *Salmonella paratyphi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5802 *Salmonella paratyphi* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5805 *Salmonella paratyphi* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5806 *Salmonella paratyphi* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6307 *Salmonella paratyphi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6308 *Salmonella paratyphi* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6990 *Salmonella paratyphi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 394 *Salmonella enteritidis* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 528 *Salmonella enteritidis* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 628 *Salmonella enteritidis* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 660 *Salmonella enteritidis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 754 *Salmonella enteritidis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1127 *Salmonella enteritidis* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1387 *Salmonella enteritidis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1422 *Salmonella enteritidis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1423 *Salmonella enteritidis* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1574 *Salmonella enteritidis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1778 *Salmonella enteritidis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2338 *Salmonella enteritidis* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2423 *Salmonella enteritidis* PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2489 *Salmonella enteritidis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2559 *Salmonella enteritidis* NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2682 *Salmonella enteritidis* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2787 *Salmonella enteritidis* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2788 *Salmonella enteritidis* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3117 *Salmonella enteritidis* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3746 *Salmonella enteritidis* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3774 *Salmonella enteritidis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4280 *Salmonella enteritidis* PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 302 *Salmonella dublin* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 420 *Salmonella dublin* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 632 *Salmonella dublin* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 782 *Salmonella dublin* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1653 *Salmonella dublin* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1963 *Salmonella dublin* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2378 *Salmonella dublin* NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2543 *Salmonella dublin* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2734 *Salmonella dublin* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2941 *Salmonella dublin* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2942 *Salmonella dublin* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3555 *Salmonella dublin* PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3861 *Salmonella dublin* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4291 *Salmonella dublin* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 1357 *Pseudomonas aeruginosa* fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5425 *Pseudomonas aeruginosa* PA3761 PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6596 *Pseudomonas aeruginosa* PA3760 PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7804 *Pseudomonas aeruginosa* ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2 *Pasteurella multocida* fruB PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4 *Pasteurella multocida* fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 16 *Pasteurella multocida* BS-ybbF PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 85 *Pasteurella multocida* ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 217 *Pasteurella multocida* EC-ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 802 *Pasteurella multocida* ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1120 *Pasteurella multocida* ptsB PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1219 *Pasteurella multocida* EC-srlB PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1220 *Pasteurella multocida* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1675 *Pasteurella multocida* EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1697 *Pasteurella multocida* EC-nagE PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1717 *Pasteurella multocida* crr PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1799 *Pasteurella multocida* ptmA PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 756 *Neisseria gonorrhoeae* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1717 *Neisseria gonorrhoeae* EC-manX PTS SYSTEM, IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 78 *Mycoplasma pneumoniae* EC-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 190 *Mycoplasma pneumoniae* trpP75145 PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 192 *Mycoplasma pneumoniae* BS-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 349 *Mycoplasma pneumoniae* EC-ptxA UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 625 *Mycoplasma pneumoniae* ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 127 *Mycoplasma genitalium* MG062 PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 144 *Mycoplasma genitalium* MG069 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 205 *Klebsiella pneumoniae* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 346 *Klebsiella pneumoniae* NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 352 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 358 *Klebsiella pneumoniae* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 724 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 725 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 730 *Klebsiella pneumoniae* PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 778 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 924 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 1456 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1457 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1544 *Klebsiella pneumoniae* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1546 *Klebsiella pneumoniae* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1570 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1571 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1787 *Klebsiella pneumoniae* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1893 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1894 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1895 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2341 *Klebsiella pneumoniae* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2342 *Klebsiella pneumoniae* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2415 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3035 *Klebsiella pneumoniae* PTS SYSTEM, ARBUTIN-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3429 *Klebsiella pneumoniae* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3431 *Klebsiella pneumoniae* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3432 *Klebsiella pneumoniae* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3594 *Klebsiella pneumoniae* PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3641 *Klebsiella pneumoniae* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3642 *Klebsiella pneumoniae* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3643 *Klebsiella pneumoniae* PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3675 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3676 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3677 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-LIKE-1 IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3831 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3834 *Klebsiella pneumoniae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3928 *Klebsiella pneumoniae* PTS SYSTEM, ARBUTIN-, CELLOBIOSE-, AND SALICIN-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3929 *Klebsiella pneumoniae* PTS SYSTEM, ARBUTIN-, CELLOBIOSE-, AND SALICIN-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4079 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4080 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4081 *Klebsiella pneumoniae* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4082 *Klebsiella pneumoniae* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4115 *Klebsiella pneumoniae* PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5646 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5650 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6463 *Klebsiella pneumoniae* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7041 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 7049 *Klebsiella pneumoniae* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7050 *Klebsiella pneumoniae* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7100 *Klebsiella pneumoniae* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7229 *Klebsiella pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7230 *Klebsiella pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7231 *Klebsiella pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7248 *Klebsiella pneumoniae* PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7509 *Klebsiella pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7510 *Klebsiella pneumoniae* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 7690 *Klebsiella pneumoniae* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 8208 *Klebsiella pneumoniae* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 8214 *Klebsiella pneumoniae* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 8215 *Klebsiella pneumoniae* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 8377 *Klebsiella pneumoniae* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 8944 *Klebsiella pneumoniae* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 9030 *Klebsiella pneumoniae* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 12193 *Haemophilus influenzae* HII147 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 17348 *Haemophilus influenzae* HI0446 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 18316 *Haemophilus influenzae* HII711 PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 20967 *Haemophilus influenzae* HI0448 PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 207 *Haemophilus ducreyi* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 402 *Haemophilus ducreyi* EC-ptxA PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1151 *Haemophilus ducreyi* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1404 *Haemophilus ducreyi* BS-ypqE PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 129 *Escherichia coli* yadI PTS SYSTEM, IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 653 *Escherichia coli* nagE PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 705 *Escherichia coli* hrsA HRSA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1063 *Escherichia coli* ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1580 *Escherichia coli* malX PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1774 *Escherichia coli* manX PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2358 *Escherichia coli* crr PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2369 *Escherichia coli* b2429 PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2631 *Escherichia coli* srlA\_2 PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2632 *Escherichia coli* srlB PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2644 *Escherichia coli* ascF PTS SYSTEM, ARBUTIN-, CELLOBIOSE-, AND SALICIN-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 3057 *Escherichia coli* agaV PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3062 *Escherichia coli* agaB PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3127 *Escherichia coli* ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3519 *Escherichia coli* mtIA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3848 *Escherichia coli* frwB PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3851 *Escherichia coli* frwD PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4077 *Escherichia coli* yjFT UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5071 *Escherichia coli* celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5073 *Escherichia coli* celA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5273 *Escherichia coli* gatB PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5274 *Escherichia coli* gatA PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5318 *Escherichia coli* fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5320 *Escherichia coli* fruB PTS SYSTEM, FRUCTOSE-SPECIFIC IIA/FPR COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5455 *Escherichia coli* b2387 PTS SYSTEM, FRUCTOSE-LIKE IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5741 *Escherichia coli* cmtA PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5742 *Escherichia coli* cmtB PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6143 *Escherichia coli* glvB PTS SYSTEM, ARBUTIN-LIKE IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6164 *Escherichia coli* bglF PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6237 *Escherichia coli* frvB PTS SYSTEM, FRUCTOSE-LIKE-1 IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6427 *Escherichia coli* yjHL PUTATIVE PHOSPHOTRANSFERASE ENZYME II, A COMPONENT SGCA (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6485 *Escherichia coli* ptxA UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6494 *Escherichia coli* treB PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6612 *Escherichia coli* frvA PTS SYSTEM, FRUCTOSE-LIKE-1 IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6714 *Escherichia coli* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 526 *Enterococcus faecium* (DOE) PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 791 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 822 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1141 *Enterococcus faecium* (DOE) PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1296 *Enterococcus faecium* (DOE) PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1362 *Enterococcus faecium* (DOE) UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1432 *Enterococcus faecium* (DOE) PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1436 *Enterococcus faecium* (DOE) PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1531 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1537 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1578 *Enterococcus faecium* (DOE) PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)



2\_7\_1\_69 1601 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1603 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1699 *Enterococcus faecium* (DOE) PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1707 *Enterococcus faecium* (DOE) PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1881 *Enterococcus faecium* (DOE) PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1883 *Enterococcus faecium* (DOE) PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1958 *Enterococcus faecium* (DOE) PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2027 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2300 *Enterococcus faecium* (DOE) EC-frvB PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2370 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2447 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2450 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2565 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2570 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2588 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2589 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2867 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2924 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2950 *Enterococcus faecium* (DOE) PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2955 *Enterococcus faecium* (DOE) PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2962 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2981 *Enterococcus faecium* (DOE) UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3022 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3023 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3083 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3087 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3093 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3095 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3112 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3178 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3311 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 3521 *Enterococcus faecium* (DOE) PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3532 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3653 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3654 *Enterococcus faecium* (DOE) PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3759 *Enterococcus faecium* (DOE) PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3777 *Enterococcus faecium* (DOE) PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3822 *Enterococcus faecium* (DOE) PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3893 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3909 *Enterococcus faecium* (DOE) UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3932 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4057 *Enterococcus faecium* (DOE) PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4061 *Enterococcus faecium* (DOE) PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 11 *Enterococcus faecalis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 70 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 155 *Enterococcus faecalis* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 185 *Enterococcus faecalis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 FRAMESHIFT  
 2\_7\_1\_69 186 *Enterococcus faecalis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 219 *Enterococcus faecalis* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 241 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 242 *Enterococcus faecalis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 246 *Enterococcus faecalis* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 272 *Enterococcus faecalis* PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 329 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 341 *Enterococcus faecalis* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 342 *Enterococcus faecalis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 355 *Enterococcus faecalis* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 356 *Enterococcus faecalis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 388 *Enterococcus faecalis* PTS SYSTEM, N-ACETYL GALACTOSAMINE-SPECIFIC IIB COMPONENT 2 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 591 *Enterococcus faecalis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 639 *Enterococcus faecalis* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 640 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 670 *Enterococcus faecalis* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 828 *Enterococcus faecalis* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 829 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 856 *Enterococcus faecalis* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1059 *Enterococcus faecalis* PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1229 *Enterococcus faecalis* EC-manX PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1230 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1317 *Enterococcus faecalis* PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 1318 *Enterococcus faecalis* BS-mtlA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1319 *Enterococcus faecalis* PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1321 *Enterococcus faecalis* PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1404 *Enterococcus faecalis* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1410 *Enterococcus faecalis* BS-ybbF PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1501 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1502 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1660 *Enterococcus faecalis* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1889 *Enterococcus faecalis* BS-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1907 *Enterococcus faecalis* PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1915 *Enterococcus faecalis* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1927 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1928 *Enterococcus faecalis* EC-yadI PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1969 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1970 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2175 *Enterococcus faecalis* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2177 *Enterococcus faecalis* EC-yjft UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2221 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2224 *Enterococcus faecalis* PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2326 *Enterococcus faecalis* EC-treB PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2327 *Enterococcus faecalis* PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2406 *Enterococcus faecalis* PTS SYSTEM, SUCROSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2592 *Enterococcus faecalis* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2654 *Enterococcus faecalis* EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2655 *Enterococcus faecalis* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2675 *Enterococcus faecalis* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2696 *Enterococcus faecalis* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2697 *Enterococcus faecalis* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2698 *Enterococcus faecalis* EC-srIB PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2724 *Enterococcus faecalis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2737 *Enterococcus faecalis* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 657 *Corynebacterium diphtheriae* PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 698 *Corynebacterium diphtheriae* PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 722 *Corynebacterium diphtheriae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 723 *Corynebacterium diphtheriae* PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 81 *Clostridium difficile* BS-fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 108 Clostridium difficile EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 187 Clostridium difficile EC-glvC PTS SYSTEM, ARBUTIN-LIKE IIBC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 193 Clostridium difficile PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 194 Clostridium difficile PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 314 Clostridium difficile PTS SYSTEM, MANNOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 500 Clostridium difficile BS-treP PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 565 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 569 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 662 Clostridium difficile PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 906 Clostridium difficile PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 907 Clostridium difficile PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC 2\_7\_1\_69)  
 2\_7\_1\_69 941 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 942 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 963 Clostridium difficile PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 966 Clostridium difficile EC-hrsA HRSA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 970 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 972 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 977 Clostridium difficile PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1075 Clostridium difficile UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B  
 COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1076 Clostridium difficile PTS SYSTEM, MANNITOL (CRYPTIC)-SPECIFIC IIA COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 1122 Clostridium difficile PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 1250 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1328 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1375 Clostridium difficile PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 1377 Clostridium difficile EC-srIB PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA  
 COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1483 Clostridium difficile PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 1486 Clostridium difficile PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 1590 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1869 Clostridium difficile BS-ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2122 Clostridium difficile EC-celC PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2123 Clostridium difficile PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2224 Clostridium difficile PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2247 Clostridium difficile PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IIABC  
 COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2249 Clostridium difficile PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2316 Clostridium difficile NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2410 Clostridium difficile PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2411 Clostridium difficile PTS SYSTEM, MANNOSE-SPECIFIC IIAB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2675 Clostridium difficile PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2676 Clostridium difficile PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2681 Clostridium difficile PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2683 Clostridium difficile EC-mtIA PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2735 Clostridium difficile PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC  
 2\_7\_1\_69)  
 2\_7\_1\_69 2749 Clostridium difficile EC-frwB PTS SYSTEM, FRUCTOSE-LIKE-2 IIB COMPONENT 1 (EC  
 2\_7\_1\_69)

2\_7\_1\_69 2776 *Clostridium difficile* PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2777 *Clostridium difficile* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2842 *Clostridium difficile* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, A COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2843 *Clostridium difficile* UNKNOWN PENTITOL PHOSPHOTRANSFERASE ENZYME II, B COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2899 *Clostridium difficile* PTS SYSTEM, MANNOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2901 *Clostridium difficile* PTS SYSTEM, SORBOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2908 *Clostridium difficile* PTS SYSTEM, GALACTITOL-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2935 *Clostridium difficile* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2936 *Clostridium difficile* PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3104 *Clostridium difficile* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3107 *Clostridium difficile* PTS SYSTEM, GLUCITOL/SORBITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3349 *Clostridium difficile* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3490 *Clostridium difficile* PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3504 *Clostridium difficile* EC-malX PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 16 *Clostridium acetobutylicum* 24407802\_F1\_19 PTS SYSTEM, MALTOSE AND GLUCOSE-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 18 *Clostridium acetobutylicum* 13859675\_F3\_96 PTS SYSTEM, GLUCOSE-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 308 *Clostridium acetobutylicum* 11953327\_C1\_69 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 309 *Clostridium acetobutylicum* 20898438\_C3\_104 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 601 *Clostridium acetobutylicum* 20508588\_C1\_42 PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 924 *Clostridium acetobutylicum* 25625325\_C1\_39 PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 948 *Clostridium acetobutylicum* 22274567\_C3\_41 PTS SYSTEM, ARBUTIN-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1510 *Clostridium acetobutylicum* 36225010\_C2\_41 PTS SYSTEM, MANNOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1511 *Clostridium acetobutylicum* 36605258\_C3\_50 PTS SYSTEM, FRUCTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1721 *Clostridium acetobutylicum* 22276875\_C1\_21 PTS SYSTEM, MANNOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1782 *Clostridium acetobutylicum* 5895253\_C1\_14 PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2184 *Clostridium acetobutylicum* 4790677\_C3\_23 PTS SYSTEM, MANNITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2186 *Clostridium acetobutylicum* 20602260\_C2\_20 PTS SYSTEM, MANNITOL-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2680 *Clostridium acetobutylicum* 24492152\_F2\_4 PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2915 *Clostridium acetobutylicum* 19634751\_C2\_12 PTS SYSTEM, GLUCOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3035 *Clostridium acetobutylicum* 19726512\_F3\_5 PTS SYSTEM, LACTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3036 *Clostridium acetobutylicum* 1992338\_F2\_3 PTS SYSTEM, LACTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3094 *Clostridium acetobutylicum* 34650050\_F3\_7 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3095 *Clostridium acetobutylicum* 2765703\_F3\_8 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)

2\_7\_1\_69 3635 *Clostridium acetobutylicum* 36023433\_F1\_1 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3638 *Clostridium acetobutylicum* 16538135\_F3\_7 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3942 *Clostridium acetobutylicum* 31365831\_F3\_3 PTS SYSTEM, GALACTITOL-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 278 *Chlamydia trachomatis* D/UW-3/Cx ptsN\_1 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 279 *Chlamydia trachomatis* D/UW-3/Cx ptsN\_2 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 714 *Chlamydia pneumoniae* AR39 CP0714 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 715 *Chlamydia pneumoniae* AR39 CP0715 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 55 *Chlamydia pneumoniae* CWL029 ptsN\_1 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 56 *Chlamydia pneumoniae* CWL029 ptsN\_2 NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 115 *Borrelia burgdorferi* BB0645 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 130 *Borrelia burgdorferi* BB0629 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 197 *Borrelia burgdorferi* BB0559 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 340 *Borrelia burgdorferi* BB0408 PTS SYSTEM, FRUCTOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 617 *Borrelia burgdorferi* BB0116 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 975 *Borrelia burgdorferi* BBB05 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 976 *Borrelia burgdorferi* BBB06 PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 999 *Borrelia burgdorferi* BBB29 PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2650 *Bordetella pertussis* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 4109 *Bordetella pertussis* PTS SYSTEM, IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 5825 *Bordetella bronchiseptica* PTS SYSTEM, IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 6992 *Bordetella bronchiseptica* EC-ptsN NITROGEN REGULATORY IIA PROTEIN (EC 2\_7\_1\_69)  
 2\_7\_1\_69 168 *Bacillus subtilis* ybbF PTS SYSTEM, SUCROSE-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 236 *Bacillus subtilis* ybfS PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 399 *Bacillus subtilis* mtIA PTS SYSTEM, MANNITOL-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 581 *Bacillus subtilis* ydhM PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 582 *Bacillus subtilis* ydhN PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 770 *Bacillus subtilis* yfIF PTS SYSTEM, N-ACETYLGLUCOSAMINE-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 780 *Bacillus subtilis* treP PTS SYSTEM, TREHALOSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 820 *Bacillus subtilis* glvC PTS SYSTEM, ARBUTIN-LIKE IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1202 *Bacillus subtilis* yjdD PTS SYSTEM, FRUCTOSE-LIKE IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1390 *Bacillus subtilis* ptsG PTS SYSTEM, GLUCOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 1441 *Bacillus subtilis* fruA PTS SYSTEM, FRUCTOSE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2220 *Bacillus subtilis* ypqE PTS SYSTEM, IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2699 *Bacillus subtilis* levE PTS SYSTEM, FRUCTOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 2700 *Bacillus subtilis* levD PTS SYSTEM, FRUCTOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3798 *Bacillus subtilis* sacP PTS SYSTEM, SUCROSE-SPECIFIC IIBC COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3850 *Bacillus subtilis* licA PTS SYSTEM, CELLOBIOSE-SPECIFIC IIA COMPONENT (EC 2\_7\_1\_69)  
 2\_7\_1\_69 3852 *Bacillus subtilis* licB PTS SYSTEM, CELLOBIOSE-SPECIFIC IIB COMPONENT (EC 2\_7\_1\_69)

- 2\_7\_1\_69 3920 *Bacillus subtilis* bgIP PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)
- 2\_7\_1\_69 4006 *Bacillus subtilis* yyzE PTS SYSTEM, BETA-GLUCOSIDES-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)
- 2\_7\_1\_71 4441 *Yersinia pseudotuberculosis* EC-aroK SHIKIMATE KINASE I (EC 2\_7\_1\_71)
- 2\_7\_1\_71 5736 *Yersinia pseudotuberculosis* EC-aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 286 *Yersinia pestis* EC-aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 552 *Yersinia pestis* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 6378 *Vibrio cholerae* El Tor N16961 ORF03325 SHIKIMATE KINASE I (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1369 *Streptococcus pyogenes* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 391 *Streptococcus pneumoniae* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 562 *Streptococcus mutans* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 803 *Streptococcus equi* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 2210 *Salmonella typhimurium* aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 5376 *Salmonella typhimurium* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 38 *Salmonella typhi* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1464 *Salmonella typhi* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1108 *Salmonella paratyphi* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 3146 *Salmonella paratyphi* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 3082 *Salmonella dublin* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 3745 *Pseudomonas aeruginosa* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1802 *Porphyromonas gingivalis* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 868 *Pasteurella multocida* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1379 *Neisseria gonorrhoeae* sp. O50467 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 134 *Mycobacterium tuberculosis* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 441 *Mycobacterium leprae* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1116 *Mycobacterium bovis* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 6589 *Klebsiella pneumoniae* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 6709 *Klebsiella pneumoniae* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 9253 *Klebsiella pneumoniae* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1111 *Helicobacter pylori* HP0157 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 149 *Helicobacter pylori* J99spJQ9ZMS3 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 7676 *Haemophilus influenzae* HI0207 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 779 *Haemophilus ducreyi* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 372 *Escherichia coli* aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 5985 *Escherichia coli* aroK SHIKIMATE KINASE I (EC 2\_7\_1\_71)
- 2\_7\_1\_71 2439 *Enterococcus faecium* (DOE) SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 2193 *Enterococcus faecalis* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 746 *Corynebacterium diphtheriae* SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 2415 *Clostridium difficile* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 1756 *Clostridium acetobutylicum* 36218767\_F3\_13 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 349 *Chlamydia trachomatis* D/UW-3/Cx aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 814 *Chlamydia pneumoniae* AR39 CP0814 SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 960 *Chlamydia pneumoniae* CWL029 aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 2390 *Campylobacter jejuni* aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 4163 *Bordetella pertussis* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 8119 *Bordetella bronchiseptica* EC-aroK SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_71 316 *Bacillus subtilis* aroL SHIKIMATE KINASE (EC 2\_7\_1\_71)
- 2\_7\_1\_73 4465 *Yersinia pseudotuberculosis* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 2770 *Yersinia pestis* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 4955 *Vibrio cholerae* El Tor N16961 ORF01473 INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 6565 *Salmonella typhimurium* gsk INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 2869 *Salmonella typhi* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 3530 *Salmonella paratyphi* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 1853 *Salmonella enteritidis* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 4693 *Salmonella dublin* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 5135 *Klebsiella pneumoniae* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 460 *Escherichia coli* gsk INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_73 3972 *Clostridium acetobutylicum* 22129386\_F2\_1 INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_87 5727 *Salmonella typhi* STREPTOMYCIN 3"-KINASE (EC 2\_7\_1\_87)
- 2\_7\_1\_87 3931 *Pseudomonas aeruginosa* str STREPTOMYCIN 3"-KINASE (EC 2\_7\_1\_87)

2\_7\_1\_90 93 *Treponema pallidum* TP0542 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 425 *Treponema pallidum* TP0108 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 946 *Porphyromonas gingivalis* PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 196 *Chlamydia trachomatis* D/UW-3/Cx pfkA\_1 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 198 *Chlamydia trachomatis* D/UW-3/Cx pfkA\_2 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 559 *Chlamydia pneumoniae* AR39 CP0559 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 611 *Chlamydia pneumoniae* AR39 CP0611 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 145 *Chlamydia pneumoniae* CWL029 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 146 *Chlamydia pneumoniae* CWL029 pfkA\_1 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 189 *Chlamydia pneumoniae* CWL029 pfkA\_2 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 40 *Borrelia burgdorferi* BB0727 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_90 711 *Borrelia burgdorferi* BB0020 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)  
 2\_7\_1\_92 8176 *Yersinia pseudotuberculosis* BS-iolC 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_92 5219 *Yersinia pestis* BS-iolC 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_92 1220 *Salmonella typhimurium* 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_92 3050 *Klebsiella pneumoniae* 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_92 2499 *Enterococcus faecium* (DOE) BS-iolC 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_92 3967 *Bacillus subtilis* iolC 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)  
 2\_7\_1\_95 524 *Streptococcus equi* PROBABLE AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE (EC 2\_7\_1\_95)  
 2\_7\_1\_95 2904 *Pseudomonas aeruginosa* aph AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE (EC 2\_7\_1\_95)  
 2\_7\_1\_95 3042 *Enterococcus faecium* (DOE) AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE (EC 2\_7\_1\_95)  
 2\_7\_2\_1 5604 *Yersinia pseudotuberculosis* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2618 *Yersinia pestis* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 4924 *Vibrio cholerae* El Tor N16961 ORF01438 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 624 *Ureaplasma urealyticum* UU484 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 194 *Treponema pallidum* TP0476 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1418 *Streptococcus pyogenes* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1057 *Streptococcus pneumoniae* BS-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 429 *Streptococcus mutans* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 584 *Streptococcus equi* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 826 *Staphylococcus aureus* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 3298 *Salmonella typhimurium* pduW ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 5414 *Salmonella typhimurium* ack ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 545 *Salmonella typhi* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2630 *Salmonella typhi* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1326 *Salmonella paratyphi* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1632 *Salmonella paratyphi* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 3066 *Salmonella paratyphi* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 108 *Rickettsia prowazekii* RP110 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1836 *Pseudomonas aeruginosa* PA1951 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 4073 *Pseudomonas aeruginosa* PA1763 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 8020 *Pseudomonas aeruginosa* PA0836 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1516 *Porphyromonas gingivalis* EC-yhaA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 833 *Pasteurella multocida* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 399 *Neisseria gonorrhoeae* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)



2\_7\_2\_1 1617 *Neisseria gonorrhoeae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 310 *Mycoplasma pneumoniae* MP309 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 4396 *Mycoplasma genitalium* MG357 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1815 *Mycobacterium tuberculosis* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 4110 *Mycobacterium bovis* BS-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2386 *Klebsiella pneumoniae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2387 *Klebsiella pneumoniae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2388 *Klebsiella pneumoniae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2745 *Klebsiella pneumoniae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1733 *Helicobacter pylori* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 837 *Helicobacter pylori* J99spJQ9ZKU5 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 19374 *Haemophilus influenzae* HI1204 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 972 *Haemophilus ducreyi* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2245 *Escherichia coli* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2707 *Enterococcus faecium* (DOE) ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2281 *Enterococcus faecalis* BS-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 829 *Corynebacterium diphtheriae* ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 3603 *Clostridium difficile* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 3355 *Clostridium acetobutylicum* 33603201\_F1\_2 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 88 *Campylobacter jejuni* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 137 *Borrelia burgdorferi* BB0622 ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 1496 *Bordetella pertussis* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 7994 *Bordetella bronchiseptica* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_1 2941 *Bacillus subtilis* ackA ACETATE KINASE (EC 2\_7\_2\_1)  
 2\_7\_2\_2 1436 *Streptococcus pyogenes* arcC CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 717 *Streptococcus pneumoniae* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1685 *Streptococcus mutans* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1083 *Streptococcus equi* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1939 *Staphylococcus aureus* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 3456 *Staphylococcus aureus* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2469 *Salmonella typhimurium* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 6623 *Salmonella typhimurium* arcC CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1043 *Salmonella typhi* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2558 *Salmonella typhi* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 646 *Salmonella paratyphi* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 647 *Salmonella paratyphi* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1794 *Salmonella enteritidis* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 3703 *Salmonella enteritidis* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2502 *Salmonella dublin* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 5232 *Pseudomonas aeruginosa* arcC CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 530 *Mycoplasma pneumoniae* MP530 CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 13436 *Haemophilus influenzae* HI0595 CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 307 *Escherichia coli* b0323 CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 504 *Escherichia coli* ybcF CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2798 *Escherichia coli* b2874 CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2781 *Enterococcus faecium* (DOE) CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 690 *Enterococcus faecalis* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 1758 *Enterococcus faecalis* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2251 *Enterococcus faecalis* trjO54531 CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_2 2461 *Enterococcus faecalis* CARBAMATE KINASE (EC 2\_7\_2\_2)  
 2\_7\_2\_4 5312 *Yersinia pseudotuberculosis* EC-lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 6039 *Yersinia pseudotuberculosis* EC-metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 7401 *Yersinia pseudotuberculosis* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 2352 *Yersinia pestis* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC  
 1\_1\_1\_3)  
 2\_7\_2\_4 5186 *Yersinia pestis* EC-lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 5245 *Yersinia pestis* EC-metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4266 *Vibrio cholerae* El Tor N16961 ORF00554 LYSINE-SENSITIVE ASPARTOKINASE III (EC  
 2\_7\_2\_4)

2\_7\_2\_4 4409 *Vibrio cholerae* El Tor N16961 ORF00761 ASPARTOKINASE 2 (EC 2\_7\_2\_4)  
 2\_7\_2\_4 6131 *Vibrio cholerae* El Tor N16961 ORF02994 ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 6432 *Vibrio cholerae* El Tor N16961 ORF03393 ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 1670 *Streptococcus pneumoniae* EC-thrA ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1672 *Streptococcus pneumoniae* ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1512 *Streptococcus mutans* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1396 *Staphylococcus aureus* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2387 *Staphylococcus aureus* ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3297 *Salmonella typhimurium* pduV LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3365 *Salmonella typhimurium* metM ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 3762 *Salmonella typhimurium* thrA2 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4854 *Salmonella typhimurium* apk LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 389 *Salmonella typhi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 1334 *Salmonella typhi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 2629 *Salmonella typhi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3161 *Salmonella typhi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 54 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 55 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 230 *Salmonella paratyphi* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 1327 *Salmonella paratyphi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 4368 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4369 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4371 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4372 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 4373 *Salmonella paratyphi* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 5000 *Salmonella paratyphi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 5001 *Salmonella paratyphi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 5002 *Salmonella paratyphi* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1278 *Salmonella enteritidis* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 1466 *Salmonella enteritidis* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3151 *Salmonella dublin* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 3915 *Salmonella dublin* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3980 *Saccharomyces cerevisiae* HOM3 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 725 *Rickettsia prowazekii* RP753 ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2653 *Pseudomonas aeruginosa* lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 241 *Porphyromonas gingivalis* EC-lysC ASPARTOKINASE ALPHA AND BETA SUBUNITS (EC 2\_7\_2\_4)  
 2\_7\_2\_4 39 *Pasteurella multocida* EC-lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 472 *Pasteurella multocida* thrA ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 733 *Neisseria gonorrhoeae* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 4370 *Mycobacterium tuberculosis* ask ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1881 *Mycobacterium leprae* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2365 *Mycobacterium leprae* ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 73 *Mycobacterium bovis* spP47731 ASPARTOKINASE (EC 2\_7\_2\_4)

2\_7\_2\_4 716 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 717 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1428 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1430 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2295 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 2296 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 2297 *Klebsiella pneumoniae* ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 2457 *Klebsiella pneumoniae* ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE  
 I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 5523 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 8096 *Klebsiella pneumoniae* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 625 *Helicobacter pylori* HP1229 ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1140 *Helicobacter pylori* J99sp|Q9ZJZ7 ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 6934 *Haemophilus influenzae* HI1632 LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 18061 *Haemophilus influenzae* HI0089 ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE I (EC 1\_1\_1\_3)  
 2\_7\_2\_4 912 *Haemophilus ducreyi* EC-lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2 *Escherichia coli* thrA ASPARTOKINASE I (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE I  
 (EC 1\_1\_1\_3)  
 2\_7\_2\_4 3838 *Escherichia coli* metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE DEHYDROGENASE  
 II (EC 1\_1\_1\_3)  
 2\_7\_2\_4 5492 *Escherichia coli* b2461 LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 6287 *Escherichia coli* lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1806 *Enterococcus faecium* (DOE) EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2210 *Enterococcus faecalis* EC-thrA LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 421 *Corynebacterium diphtheriae* ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1940 *Clostridium difficile* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2084 *Clostridium difficile* LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 3699 *Clostridium difficile* BS-dapG ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1256 *Clostridium acetobutylicum* 7303427\_F3\_23 ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2810 *Clostridium acetobutylicum* 20351078\_C2\_16 ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 344 *Chlamydia trachomatis* D/UW-3/Cx lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC  
 2\_7\_2\_4)  
 2\_7\_2\_4 803 *Chlamydia pneumoniae* AR39 CP0803 LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 971 *Chlamydia pneumoniae* CWL029 lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1415 *Campylobacter jejuni* lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2324 *Bordetella pertussis* BS-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 4376 *Bordetella pertussis* ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 7197 *Bordetella bronchiseptica* EC-lysC ASPARTOKINASE (EC 2\_7\_2\_4)  
 2\_7\_2\_4 380 *Bacillus subtilis* yclM LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)  
 2\_7\_2\_4 1676 *Bacillus subtilis* dapG ASPARTOKINASE I (EC 2\_7\_2\_4)  
 2\_7\_2\_4 2841 *Bacillus subtilis* lysC ASPARTOKINASE 2 (EC 2\_7\_2\_4)  
 2\_7\_2\_7 16 *Enterococcus faecalis* BS-yqiU BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 2729 *Clostridium difficile* BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 3116 *Clostridium difficile* BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 3566 *Clostridium difficile* BS-yqiU BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 1216 *Clostridium acetobutylicum* 23492127\_C2\_52 BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 2356 *Clostridium acetobutylicum* 9817175\_F2\_7 BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_7 2402 *Bacillus subtilis* yqiU BUTYRATE KINASE (EC 2\_7\_2\_7)  
 2\_7\_2\_8 7306 *Yersinia pseudotuberculosis* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1384 *Yersinia pestis* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 6392 *Vibrio cholerae* El Tor NI6961 ORF03341 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1662 *Streptococcus mutans* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 2078 *Staphylococcus aureus* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 6800 *Salmonella typhimurium* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 6801 *Salmonella typhimurium* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1902 *Salmonella typhi* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 3902 *Salmonella paratyphi* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1677 *Salmonella enteritidis* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)

2\_7\_2\_8 3693 *Salmonella dublin* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 4070 *Saccharomyces cerevisiae* ARG5,6 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8) / N-ACETYL-  
 GAMMA-GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 2\_7\_2\_8 6946 *Pseudomonas aeruginosa* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 549 *Pasteurella multocida* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 236 *Neurospora crassa* arg-6 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8) / N-ACETYL-GAMMA-  
 GLUTAMYL-PHOSPHATE REDUCTASE (EC 1\_2\_1\_38)  
 2\_7\_2\_8 997 *Neisseria gonorrhoeae* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 5043 *Mycobacterium tuberculosis* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 23 *Mycobacterium leprae* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1855 *Mycobacterium bovis* BS-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 7473 *Klebsiella pneumoniae* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 298 *Haemophilus ducreyi* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 3857 *Escherichia coli* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1488 *Corynebacterium diphtheriae* ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 475 *Clostridium difficile* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 900 *Clostridium acetobutylicum* 10581300\_C3\_82 ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 2150 *Campylobacter jejuni* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 3405 *Bordetella pertussis* BS-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 5930 *Bordetella bronchiseptica* EC-argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_2\_8 1122 *Bacillus subtilis* argB ACETYLGLUTAMATE KINASE (EC 2\_7\_2\_8)  
 2\_7\_3\_3 1043 *Staphylococcus aureus* BS-yacI ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 2965 *Clostridium difficile* BS-yacI ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 1084 *Clostridium acetobutylicum* 23832312\_C3\_55 ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 644 *Chlamydia trachomatis* D/UW-3/Cx BS-yacI ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 45 *Chlamydia pneumoniae* AR39 CP0045 ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 645 *Chlamydia pneumoniae* CWL029 BS-yacI ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_3 85 *Bacillus subtilis* yacI ARGININE KINASE (EC 2\_7\_3\_3)  
 2\_7\_3\_9 5194 *Yersinia pseudotuberculosis* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 7894 *Yersinia pseudotuberculosis* EC-ptsA PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 769 *Yersinia pestis* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC  
 2\_7\_3\_9)  
 2\_7\_3\_9 4695 *Yersinia pestis* EC-ptsA PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4791 *Yersinia pestis* EC-ptsP PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4530 *Vibrio cholerae* El Tor N16961 ORF00910 PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4798 *Vibrio cholerae* El Tor N16961 ORF01275 PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1226 *Treponema pallidum* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC  
 2\_7\_3\_9)  
 2\_7\_3\_9 1348 *Streptococcus pyogenes* ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1609 *Streptococcus pneumoniae* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 388 *Streptococcus mutans* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 (EC 2\_7\_3\_9)  
 2\_7\_3\_9 255 *Streptococcus equi* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1805 *Staphylococcus aureus* sp|P51183 PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 371 *Salmonella typhimurium* ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 (EC 2\_7\_3\_9)  
 2\_7\_3\_9 571 *Salmonella typhimurium* ptsP PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE  
 PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2701 *Salmonella typhimurium* ptsA PHOSPHOENOLPYRUVATE-PROTEIN  
 PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2101 *Salmonella typhi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC  
 2\_7\_3\_9)

2\_7\_3\_9 4127 *Salmonella typhi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1435 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1436 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1437 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1438 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3617 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3618 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1624 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2177 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2355 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3342 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4282 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3274 *Salmonella dublin* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4109 *Salmonella dublin* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4590 *Pseudomonas aeruginosa* ptsP PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1718 *Pasteurella multocida* ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1719 *Neisseria gonorrhoeae* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 216 *Mycoplasma pneumoniae* MP215 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3253 *Mycoplasma genitalium* MG429 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3592 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 3593 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 6781 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 6782 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 6783 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 9437 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 11011 *Haemophilus influenzae* HII 712 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1405 *Haemophilus ducreyi* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2357 *Escherichia coli* ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 5451 *Escherichia coli* b2383 PUTATIVE PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE YPDD (EC 2\_7\_3\_9)  
 2\_7\_3\_9 5685 *Escherichia coli* ptsP PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSP (EC 2\_7\_3\_9)  
 2\_7\_3\_9 6264 *Escherichia coli* ptsA PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE PTSA (EC 2\_7\_3\_9)

2\_7\_3\_9 291 *Enterococcus faecium* (DOE) PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 2749 *Enterococcus faecium* (DOE) PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1895 *Enterococcus faecalis* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 726 *Corynebacterium diphtheriae* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1461 *Clostridium difficile* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1366 *Clostridium acetobutylicum* 6814125\_C3\_44 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 321 *Chlamydia trachomatis* D/UW-3/Cx EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 737 *Chlamydia pneumoniae* AR39 CP0737 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 38 *Chlamydia pneumoniae* CWL029 EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 198 *Borrelia burgdorferi* BB0558 PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 4111 *Bordetella pertussis* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 8922 *Bordetella bronchiseptica* PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 9703 *Bordetella bronchiseptica* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_3\_9 1392 *Bacillus subtilis* ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)  
 2\_7\_4\_1 4919 *Yersinia pseudotuberculosis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 5972 *Yersinia pseudotuberculosis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 763 *Yersinia pestis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 3526 *Yersinia pestis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 4578 *Vibrio cholerae* El Tor N16961 ORF00979 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 4701 *Vibrio cholerae* El Tor N16961 ORF01132 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 162 *Treponema pallidum* TP0441 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1526 *Salmonella typhimurium* ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 3803 *Salmonella typhimurium* yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 3523 *Salmonella typhi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 5268 *Salmonella typhi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 2175 *Salmonella paratyphi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 4704 *Salmonella paratyphi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 3074 *Salmonella enteritidis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 4266 *Salmonella enteritidis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 2523 *Saccharomyces cerevisiae* UTR1 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 2810 *Saccharomyces cerevisiae* YEL041W POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1056 *Pseudomonas aeruginosa* ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1344 *Pseudomonas aeruginosa* PA3088 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 627 *Porphyromonas gingivalis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1589 *Porphyromonas gingivalis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1369 *Pasteurella multocida* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD<sup>+</sup> KINASE (EC 2\_7\_1\_23)

2\_7\_4\_1 920 *Neisseria gonorrhoeae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1134 *Neisseria gonorrhoeae* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 3560 *Mycobacterium tuberculosis* Rv1695 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 5956 *Mycobacterium tuberculosis* ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1063 *Mycobacterium leprae* spQ49897 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 3819 *Mycobacterium leprae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 2744 *Mycobacterium bovis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 2745 *Mycobacterium bovis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 8566 *Klebsiella pneumoniae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 8568 *Klebsiella pneumoniae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 8569 *Klebsiella pneumoniae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 416 *Helicobacter pylori* HP1010 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 783 *Helicobacter pylori* HP1394 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 415 *Helicobacter pylori* J99 ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1421 *Helicobacter pylori* J99 jhp1433 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 14494 *Haemophilus influenzae* HI0072 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 447 *Haemophilus ducreyi* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 2441 *Escherichia coli* ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 2551 *Escherichia coli* yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 446 *Enterococcus faecalis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 706 *Corynebacterium diphtheriae* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 583 *Clostridium difficile* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1668 *Clostridium acetobutylicum* 26209387\_C1\_28 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 2292 *Clostridium acetobutylicum* 5120952\_F2\_10 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 3307 *Clostridium acetobutylicum* 20090925\_C2\_9 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 4007 *Clostridium acetobutylicum* 4038502\_F3\_2 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 22 *Campylobacter jejuni* Cj0641 POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 284 *Campylobacter jejuni* ppk POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 1874 *Borrelia burgdorferi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1876 *Borrelia burgdorferi* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1019 *Bordetella pertussis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1827 *Bordetella pertussis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 3785 *Bordetella pertussis* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 7668 *Bordetella bronchiseptica* POLYPHOSPHATE KINASE (EC 2\_7\_4\_1)  
 2\_7\_4\_1 8242 *Bordetella bronchiseptica* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_1 1162 *Bacillus subtilis* yjbN POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)  
 2\_7\_4\_16 7439 *Yersinia pseudotuberculosis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 2735 *Yersinia pestis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 6040 *Vibrio cholerae* El Tor N16961 ORF02870 THIAMINE-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 920 *Salmonella typhimurium* thiL THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 828 *Salmonella typhi* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 5046 *Salmonella paratyphi* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 534 *Salmonella dublin* THIAMINE-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 6659 *Pseudomonas aeruginosa* thiL THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 494 *Porphyromonas gingivalis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)

2\_7\_4\_16 858 *Pasteurella multocida* thiL THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 281 *Neisseria gonorrhoeae* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 797 *Mycobacterium tuberculosis* thiL THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 2269 *Mycobacterium leprae* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 3037 *Mycobacterium bovis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 1097 *Klebsiella pneumoniae* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 1098 *Klebsiella pneumoniae* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 1099 *Klebsiella pneumoniae* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 6377 *Haemophilus influenzae* HI1305 THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 770 *Haemophilus ducreyi* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 401 *Escherichia coli* b0417 THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 1930 *Corynebacterium diphtheriae* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 2355 *Corynebacterium diphtheriae* THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 2957 *Campylobacter jejuni* thiL THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 3713 *Bordetella pertussis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 8925 *Bordetella bronchiseptica* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_16 590 *Bacillus subtilis* ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)  
 2\_7\_4\_7 5490 *Yersinia pseudotuberculosis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 6974 *Yersinia pseudotuberculosis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 4524 *Yersinia pestis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 5121 *Vibrio cholerae* El Tor N16961 ORF01679 PHOSPHOMETHYLPYRIMIDINE KINASE (EC  
 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 433 *Treponema pallidum* TP0115 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 263 *Streptococcus pyogenes* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 801 *Streptococcus pneumoniae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 908 *Streptococcus pneumoniae* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1284 *Streptococcus mutans* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 619 *Streptococcus equi* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1541 *Staphylococcus aureus* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2178 *Staphylococcus aureus* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 933 *Salmonella typhimurium* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 4597 *Salmonella typhi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1640 *Salmonella paratyphi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1641 *Salmonella paratyphi* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 288 *Salmonella enteritidis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2121 *Salmonella dublin* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7);  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 6755 *Saccharomyces cerevisiae* THI22 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 TRANSCRIPTIONAL ACTIVATOR TENA  
 2\_7\_4\_7 7886 *Saccharomyces cerevisiae* THI20 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 TRANSCRIPTIONAL ACTIVATOR TENA  
 2\_7\_4\_7 8374 *Saccharomyces cerevisiae* THI21 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 TRANSCRIPTIONAL ACTIVATOR TENA  
 2\_7\_4\_7 3682 *Pseudomonas aeruginosa* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) /  
 HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)



2\_7\_4\_7 1259 *Porphyromonas gingivalis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3) / PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49) / THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)  
 2\_7\_4\_7 201 *Pasteurella multocida* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 152 *Neurospora crassa* BAA21049\_1 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / TRANSCRIPTIONAL ACTIVATOR TENA  
 2\_7\_4\_7 1577 *Neisseria gonorrhoeae* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 5000 *Mycobacterium tuberculosis* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1945 *Mycobacterium lepraesp*|Q9ZBL1 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2112 *Mycobacterium bovis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 3408 *Klebsiella pneumoniae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 266 *Helicobacter pylori* HP0844 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 781 *Helicobacter pylori* J99sp|Q9ZL00 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 4519 *Haemophilus influenzae* HI0416 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 5280 *Escherichia coli* b2103 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1180 *Enterococcus faecium* (DOE) PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2536 *Enterococcus faecium* (DOE) PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1443 *Enterococcus faecalis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2776 *Enterococcus faecalis* BS-thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2947 *Enterococcus faecalis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1778 *Corynebacterium diphtheriae* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1247 *Clostridium difficile* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1374 *Clostridium acetobutylicum* 7235943\_C2\_37 PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 2885 *Campylobacter jejuni* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 108 *Bordetella pertussis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 3746 *Bordetella pertussis* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 5606 *Bordetella bronchiseptica* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 7781 *Bordetella bronchiseptica* PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 1172 *Bacillus subtilis* yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_4\_7 3795 *Bacillus subtilis* thiD PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)  
 2\_7\_6\_2 985 *Streptococcus pyogenes* BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 706 *Streptococcus pneumoniae* THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 1039 *Streptococcus mutans* BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 1021 *Streptococcus equi* BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 1085 *Staphylococcus aureus* BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 4782 *Saccharomyces cerevisiae* TH180 THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
 2\_7\_6\_2 1722 *Neisseria gonorrhoeae* THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)

2\_7\_6\_2 3509 *Enterococcus faecium* (DOE) BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
2\_7\_6\_2 241 *Bordetella pertussis* THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
2\_7\_6\_2 7686 *Bordetella bronchiseptica* THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)  
2\_7\_6\_3 6004 *Yersinia pseudotuberculosis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 4151 *Yersinia pestis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 4391 *Vibrio cholerae* El Tor N16961 ORF00734 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 4452 *Vibrio cholerae* El Tor N16961 ORF00815 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 945 *Streptococcus pyogenes* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 612 *Streptococcus pneumoniae* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3) / DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)  
2\_7\_6\_3 635 *Streptococcus equi* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 1987 *Salmonella typhimurium* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2691 *Salmonella typhi* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 5840 *Salmonella paratyphi* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2877 *Salmonella enteritidis* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2576 *Salmonella dublin* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2347 *Saccharomyces cerevisiae* FOL1 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2175 *Pseudomonas aeruginosa* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2503 *Pseudomonas aeruginosa* PA0583 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 106 *Porphyromonas gingivalis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 1686 *Pasteurella multocida* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 24 *Neisseria gonorrhoeae* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 2978 *Mycobacterium tuberculosis* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 3073 *Mycobacterium leprae* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 3972 *Mycobacterium bovis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 1115 *Klebsiella pneumoniae* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 441 *Helicobacter pylori* HP1036 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 390 *Helicobacter pylori* J99 folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 7348 *Haemophilus influenzae* HI0064 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 224 *Haemophilus ducreyi* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 4349 *Escherichia coli* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 1278 *Enterococcus faecalis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
2\_7\_6\_3 484 *Corynebacterium diphtheriae* 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)

2\_7\_6\_3 1996 *Clostridium difficile* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
 2\_7\_6\_3 986 *Clostridium acetobutylicum* 23626540\_C2\_46 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3) / DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)  
 2\_7\_6\_3 584 *Chlamydia trachomatis* D/UW-3/Cx folP 2-amino-4-hydroxy-6-hydroxymethyldihydropterin pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_7\_6\_3 1114 *Chlamydia pneumoniae* AR39 CPI114 2-amino-4-hydroxy-6-hydroxymethyldihydropterin pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_7\_6\_3 696 *Chlamydia pneumoniae* CWL029 folP 2-amino-4-hydroxy-6-hydroxymethyldihydropterin pyrophosphokinase (EC 2\_7\_6\_3)/dihydropteroate synthase (EC 2\_5\_1\_15)  
 2\_7\_6\_3 1200 *Campylobacter jejuni* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
 2\_7\_6\_3 2378 *Bordetella pertussis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
 2\_7\_6\_3 5938 *Bordetella bronchiseptica* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
 2\_7\_6\_3 79 *Bacillus subtilis* folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)  
 2\_7\_6\_5 7788 *Yersinia pseudotuberculosis* EC-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 4931 *Yersinia pestis* EC-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 689 *Vibrio cholerae* El Tor N16961 ORF03098 GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 498 *Streptococcus pyogenes* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1229 *Streptococcus pyogenes* BS-ywaC GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 773 *Streptococcus pneumoniae* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 244 *Streptococcus mutans* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 2042 *Streptococcus mutans* BS-ywaC GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 79 *Streptococcus equi* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 872 *Streptococcus equi* BS-relA PUTATIVE GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1447 *Staphylococcus aureus* BS-ywaC GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3595 *Staphylococcus aureus* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3758 *Staphylococcus aureus* BS-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 6012 *Salmonella typhimurium* relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 2163 *Salmonella typhi* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3523 *Salmonella paratyphi* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3524 *Salmonella paratyphi* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1096 *Salmonella enteritidis* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1140 *Salmonella dublin* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 6610 *Pseudomonas aeruginosa* relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 468 *Porphyromonas gingivalis* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1139 *Pasteurella multocida* relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1946 *Neisseria gonorrhoeae* EC-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 21 *Mycobacterium tuberculosis* Rv1366 GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1963 *Mycobacterium bovis* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3465 *Klebsiella pneumoniae* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3466 *Klebsiella pneumoniae* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 739 *Haemophilus influenzae* HI0334 GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 674 *Haemophilus ducreyi* BS-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 5657 *Escherichia coli* relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 586 *Enterococcus faecium* (DOE) GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 447 *Enterococcus faecalis* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1685 *Corynebacterium diphtheriae* GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 681 *Clostridium difficile* BS-yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1299 *Clostridium acetobutylicum* 24640635\_C1\_23 GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1587 *Clostridium acetobutylicum* 24354002\_C1\_32 GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 2778 *Bordetella pertussis* EC-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 1161 *Bacillus subtilis* yjbM GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_6\_5 3841 *Bacillus subtilis* ywaC GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)  
 2\_7\_7\_13 2591 *Saccharomyces cerevisiae* PSA1 MANNOSYL-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 4346 *Pseudomonas aeruginosa* PA0597 MANNOSYL-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)

2\_7\_7\_13 953 *Neisseria gonorrhoeae* BS-yfnH MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 2869 *Mycobacterium tuberculosis* rmlA2 MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 2574 *Mycobacterium leprae* BS-yfnH MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 2575 *Mycobacterium leprae* MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 1071 *Mycobacterium bovis* BS-yfnH MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 1632 *Corynebacterium diphtheriae* MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 1133 *Clostridium acetobutylicum* 25682802\_C2\_43 MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 674 *Campylobacter jejuni* Cj1416c MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 688 *Campylobacter jejuni* Cj1423c MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 1045 *Campylobacter jejuni* Cj1329 MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_13 905 *Bordetella pertussis* BS-yfnH MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)  
 2\_7\_7\_14 6600 *Saccharomyces cerevisiae* MUQ1 CTP: PHOSPHOETHANOLAMINE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_14)  
 2\_7\_7\_2 8052 *Yersinia pseudotuberculosis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 3832 *Yersinia pestis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 493 *Ureaplasma urealyticum* UU355 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 666 *Treponema pallidum* TP0888 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 681 *Streptococcus pyogenes* mreA RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1465 *Streptococcus pneumoniae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1853 *Streptococcus mutans* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 13 *Streptococcus equi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 2663 *Staphylococcus aureus* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 5767 *Salmonella typhimurium* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 4732 *Salmonella typhi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 2866 *Salmonella paratyphi* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 4230 *Saccharomyces cerevisiae* FAD1 FAD SYNTHETASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 4167 *Pseudomonas aeruginosa* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1607 *Porphyromonas gingivalis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 767 *Pasteurella multocida* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 334 *Neisseria gonorrhoeae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 674 *Mycoplasma pneumoniae* MP674 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1366 *Mycoplasma genitalium* MG145 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 4232 *Mycobacterium tuberculosis* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)

2\_7\_7\_2 2318 *Mycobacterium leprae* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 518 *Mycobacterium bovis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 6239 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 6240 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 6241 *Klebsiella pneumoniae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 491 *Helicobacter pylori* HP1087 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 342 *Helicobacter pylori* J99 ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 19847 *Haemophilus influenzae* HI0963 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1444 *Haemophilus ducreyi* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 25 *Escherichia coli* yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_2)  
 2\_7\_7\_2 3670 *Enterococcus faecium* (DOE) EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1322 *Corynebacterium diphtheriae* RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 2033 *Clostridium difficile* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 3197 *Clostridium acetobutylicum* 2531502\_F2\_4 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 91 *Chlamydia trachomatis* D/UW-3/Cx EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 437 *Chlamydia pneumoniae* AR39 CP0437 RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 287 *Chlamydia pneumoniae* CWL029 EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26); / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1403 *Campylobacter jejuni* ribF RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 974 *Bordetella pertussis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 6588 *Bordetella bronchiseptica* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)  
 2\_7\_7\_2 1667 *Bacillus subtilis* ribC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_2)  
 2\_7\_7\_2 2774 *Yersinia pestis*trQ9RCC5 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) /  
 MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 4122 *Vibrio cholerae* El Tor N16961 ORF00339 MANNOSE-1-PHOSPHATE  
 GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 6481 *Salmonella typhimurium*spP26404 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) /  
 MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 6504 *Salmonella typhimurium*spP26340 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) /  
 MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 1003 *Salmonella typhi* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-  
 PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 1966 *Salmonella typhi* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-  
 PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 1951 *Salmonella paratyphi* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-  
 PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 1953 *Salmonella paratyphi* MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC  
 2\_7\_7\_22)  
 2\_7\_7\_2 6181 *Salmonella paratyphi* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-  
 PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_2 3125 *Salmonella enteritidis* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-  
 PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)

2\_7\_7\_22 1504 *Salmonella dublin* MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 3369 *Pseudomonas aeruginosa* wbpW MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 6272 *Pseudomonas aeruginosa* algA MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 8462 *Pseudomonas aeruginosa* PA2232 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 73 *Porphyromonas gingivalis* MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 80 *Porphyromonas gingivalis* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 1004 *Helicobacter pylori* HP0043 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 37 *Helicobacter pylori* J99 manC MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 5244 *Escherichia coli* cpsB MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 257 *Clostridium difficile* MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 1110 *Clostridium acetobutylicum* 7079678\_C3\_82 MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 1135 *Clostridium acetobutylicum* 29322135\_C3\_50 MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 1213 *Clostridium acetobutylicum* 19664125\_C2\_53 MANNOSE-1-PHOSPHATE GUANYLYLTRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_22 2648 *Bacillus subtilis* yrkC MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)  
 2\_7\_7\_24 6241 *Yersinia pseudotuberculosis* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1633 *Yersinia pestis* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1392 *Streptococcus pyogenes* cpsFO GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 75 *Streptococcus mutans* sp. P95778 GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 365 *Streptococcus equi* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4177 *Salmonella typhimurium* trjQ9L6R2 GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 6491 *Salmonella typhimurium* rfbA GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 905 *Salmonella typhi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 2914 *Salmonella typhi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4249 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4891 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4892 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 3589 *Salmonella enteritidis* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1238 *Salmonella dublin* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 3294 *Salmonella dublin* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1467 *Pseudomonas aeruginosa* rmlA GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1384 *Porphyromonas gingivalis* BS-spsI GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 703 *Neisseria gonorrhoeae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 3414 *Mycobacterium tuberculosis* rmlA GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)

2\_7\_7\_24 565 *Mycobacterium leprae* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 2904 *Mycobacterium bovis* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1017 *Klebsiella pneumoniae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4837 *Klebsiella pneumoniae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 4838 *Klebsiella pneumoniae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1528 *Haemophilus ducreyi* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 3699 *Escherichia coli* rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 5234 *Escherichia coli* rfbA GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 2912 *Enterococcus faecium* (DOE) GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 512 *Enterococcus faecalis* BS-spsI GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 394 *Corynebacterium diphtheriae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 2192 *Corynebacterium diphtheriae* GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 2507 *Clostridium acetobutylicum* 34070253\_C3\_16 GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 599 *Chlamydia trachomatis* D/UW-3/Cx glmU GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 1124 *Chlamydia pneumoniae* AR39 CP1124 GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 688 *Chlamydia pneumoniae* CWL029 glmU GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_24 3777 *Bacillus subtilis* spsI GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)  
 2\_7\_7\_25 4553 *Yersinia pseudotuberculosis* EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5476 *Yersinia pseudotuberculosis* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 643 *Yersinia pestis* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 4150 *Yersinia pestis* EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 4453 *Vibrio cholerae* El Tor N16961 ORF00816 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 6206 *Vibrio cholerae* El Tor N16961 ORF03093 TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 843 *Treponema pallidum* TP0270 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1010 *Treponema pallidum* TP0596 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1225 *Streptococcus pyogenes* papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1365 *Streptococcus pyogenes* BS-ytoI TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 679 *Streptococcus pneumoniae* BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 762 *Streptococcus pneumoniae* BS-ytoI TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1412 *Streptococcus mutans* BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2071 *Streptococcus mutans* BS-ytoI TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 610 *Streptococcus equi* BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 805 *Streptococcus equi* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2065 *Staphylococcus aureus* BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)

2\_7\_7\_25 3387 *Staphylococcus aureus* BS-*ytol* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1988 *Salmonella typhimurium* *pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2015 *Salmonella typhimurium* *cca* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 76 *Salmonella typhi* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1219 *Salmonella typhi* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2131 *Salmonella paratyphi* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2132 *Salmonella paratyphi* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2133 *Salmonella paratyphi* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5841 *Salmonella paratyphi* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5842 *Salmonella paratyphi* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 3227 *Saccharomyces cerevisiae* *CCA1* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 14 *Rickettsia prowazekii* *RP015* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 7601 *Pseudomonas aeruginosa* *cca* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 8392 *Pseudomonas aeruginosa* *pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 833 *Porphyromonas gingivalis* BS-*papS* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 531 *Pasteurella multocida* *cca* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1685 *Pasteurella multocida* *pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 315 *Neisseria gonorrhoeae* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1985 *Neisseria gonorrhoeae* EC-*pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1683 *Mycobacterium tuberculosis* *pcnA* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1442 *Mycobacterium leprae* BS-*papS* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1917 *Mycobacterium bovis* BS-*papS* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5811 *Klebsiella pneumoniae* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5812 *Klebsiella pneumoniae* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 75 *Helicobacter pylori* *HP0640* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 584 *Helicobacter pylori* *J99tr|Q9ZLJ6* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 147 *Haemophilus influenzae* *HI0063* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 6893 *Haemophilus influenzae* *HI1606* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 223 *Haemophilus ducreyi* EC-*pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1048 *Haemophilus ducreyi* *tr|Q9L7A3* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2979 *Escherichia coli* *cca* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 4350 *Escherichia coli* *pcnB* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 444 *Enterococcus faecium* (DOE) TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 3697 *Enterococcus faecium* (DOE) TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1508 *Enterococcus faecalis* BS-*papS* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2774 *Enterococcus faecalis* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1678 *Corynebacterium diphtheriae* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 3218 *Clostridium difficile* BS-*papS* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 366 *Clostridium acetobutylicum* *22844452\_C2\_137* TRNA NUCLEOTIDYLTRANSFERASE (EC  
 2\_7\_7\_25)  
 2\_7\_7\_25 854 *Clostridium acetobutylicum* *13680337\_C2\_57* POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA  
 NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)



2\_7\_7\_25 2550 *Clostridium acetobutylicum* 24251587\_C2\_27 TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 389 *Chlamydia trachomatis* D/UW-3/Cx EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 673 *Chlamydia trachomatis* D/UW-3/Cx BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 894 *Chlamydia pneumoniae* AR39 CP0894 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1024 *Chlamydia pneumoniae* AR39 CP1024 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 777 *Chlamydia pneumoniae* CWL029 BS-papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 892 *Chlamydia pneumoniae* CWL029 EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 1324 *Campylobacter jejuni* Cj0789 TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 58 *Borrelia burgdorferi* BB0706 POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2379 *Bordetella pertussis* EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 3630 *Bordetella pertussis* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5912 *Bordetella bronchiseptica* TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 5999 *Bordetella bronchiseptica* EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2241 *Bacillus subtilis* papS POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_25 2921 *Bacillus subtilis* ytoI TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)  
 2\_7\_7\_27 7615 *Yersinia pseudotuberculosis* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 375 *Yersinia pestis* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 5525 *Vibrio cholerae* El Tor N16961 ORF02203 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 7205 *Vibrio cholerae* El Tor N16961 ORFA00388 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 1331 *Streptococcus pneumoniae* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 1421 *Streptococcus mutans* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 1221 *Streptococcus equi* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 471 *Salmonella typhimurium* glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 2113 *Salmonella typhi* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 2352 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 3398 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 4335 *Salmonella enteritidis* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 3984 *Salmonella dublin* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 4332 *Salmonella dublin* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 4615 *Salmonella dublin* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 704 *Pasteurella multocida* glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 5076 *Mycobacterium tuberculosis* glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 1123 *Mycobacterium leprae* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 2678 *Mycobacterium bovis* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 5874 *Klebsiella pneumoniae* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 6451 *Haemophilus influenzae* HI1359 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 6007 *Escherichia coli* glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 813 *Corynebacterium diphtheriae* GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)

2\_7\_7\_27 630 *Clostridium difficile* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 2207 *Clostridium acetobutylicum* 30100157\_C1\_21 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 2208 *Clostridium acetobutylicum* 26571012\_C2\_29 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 465 *Chlamydia trachomatis* D/UW-3/Cx glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 140 *Chlamydia pneumoniae* AR39 CP0140 GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 555 *Chlamydia pneumoniae* CWL029 glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_27 3091 *Bacillus subtilis* glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)  
 2\_7\_7\_3 5181 *Yersinia pseudotuberculosis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 4845 *Yersinia pestis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 4104 *Vibrio cholerae* El Tor N16961 ORF00316 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 834 *Treponema pallidum* TP0283 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1440 *Streptococcus pyogenes* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1777 *Streptococcus pneumoniae* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1326 *Streptococcus mutans* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 129 *Streptococcus equi* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 2694 *Staphylococcus aureus* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1744 *Salmonella typhimurium* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1323 *Salmonella typhi* PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1047 *Salmonella enteritidis* PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 663 *Salmonella dublin* PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1016 *Pseudomonas aeruginosa* coaD PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 711 *Porphyromonas gingivalis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1937 *Pasteurella multocida* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1469 *Neisseria gonorrhoeae* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 811 *Mycobacterium tuberculosis* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 791 *Mycobacterium lepraesp*|O69466 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 3526 *Mycobacterium bovis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 534 *Klebsiella pneumoniae* PANTETHEINE-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 4792 *Klebsiella pneumoniae* PANTETHEINE-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 856 *Helicobacter pylori* HP1475 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1355 *Helicobacter pylori* J99sp|Q9ZJE4 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 16897 *Haemophilus influenzae* HI0651 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 754 *Haemophilus ducreyi* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 3554 *Escherichia coli* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)

2\_7\_7\_3 2085 *Enterococcus faecium* (DOE) PANTETHEINE-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 2092 *Enterococcus faecium* (DOE) PANTETHEINE-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 2521 *Enterococcus faecalis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1936 *Corynebacterium diphtheriae* PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1046 *Clostridium difficile* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 3231 *Clostridium acetobutylicum* 4141912\_C2\_12 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1359 *Campylobacter jejuni* kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 60 *Borrelia burgdorferi* BB0702 PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1281 *Bordetella pertussis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 6577 *Bordetella bronchiseptica* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_3 1503 *Bacillus subtilis* ylbI PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)  
 2\_7\_7\_33 222 *Yersinia pseudotuberculosis* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 2642 *Yersinia pestis* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 6488 *Salmonella typhimurium* rfbF GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 4683 *Salmonella typhi* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 4895 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 4896 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 99 *Salmonella enteritidis* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 3290 *Salmonella dublin* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_33 727 *Bacillus subtilis* ynfH GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)  
 2\_7\_7\_38 5728 *Yersinia pseudotuberculosis* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 745 *Yersinia pestis* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 5671 *Vibrio cholerae* El Tor N16961 ORF02367 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2423 *Salmonella typhimurium* kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2233 *Salmonella typhi* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2320 *Salmonella paratyphi* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2321 *Salmonella paratyphi* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2030 *Salmonella enteritidis* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2535 *Salmonella dublin* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 372 *Rickettsia prowazekii* RP379 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 4143 *Pseudomonas aeruginosa* kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 1006 *Porphyromonas gingivalis* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 1679 *Pasteurella multocida* kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 640 *Neisseria gonorrhoeae* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 3005 *Klebsiella pneumoniae* 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)

2\_7\_7\_38 1177 *Helicobacter pylori* HP0230 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 220 *Helicobacter pylori* J99spiQ9ZMK4 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 21757 *Haemophilus influenzae* HI0058 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 849 *Haemophilus ducreyi* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 884 *Escherichia coli* kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC  
 2\_7\_7\_38)  
 2\_7\_7\_38 174 *Chlamydia trachomatis* D/UW-3/Cx EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 527 *Chlamydia pneumoniae* AR39 CP0527 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 207 *Chlamydia pneumoniae* CWL029 EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 412 *Campylobacter jejuni* kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 2989 *Bordetella pertussis* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_38 5022 *Bordetella bronchiseptica* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE  
 CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)  
 2\_7\_7\_40 853 *Streptococcus pneumoniae* BS-yacM D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)  
 2\_7\_7\_40 2442 *Staphylococcus aureus* BS-yacM D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)  
 2\_7\_7\_40 2902 *Staphylococcus aureus* D-RIBITOL-5-PHOSPHATE CYTIDYLYLTRANSFERASE (EC  
 2\_7\_7\_40)  
 2\_7\_7\_40 954 *Salmonella paratyphi* D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)  
 2\_7\_7\_40 955 *Salmonella paratyphi* D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)  
 2\_7\_7\_40 443 *Chlamydia trachomatis* D/UW-3/Cx BS-yacM D-ribitol-5-phosphate cytidyltransferase (EC  
 2\_7\_7\_40)  
 2\_7\_7\_40 169 *Chlamydia pneumoniae* AR39 CP0169 D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)  
 2\_7\_7\_40 528 *Chlamydia pneumoniae* CWL029 BS-yacM D-ribitol-5-phosphate cytidyltransferase (EC  
 2\_7\_7\_40)  
 2\_7\_7\_42 6017 *Yersinia pseudotuberculosis* EC-glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 365 *Yersinia pestis* EC-glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 6198 *Vibrio cholerae* El Tor N16961 ORF03084 GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 1662 *Salmonella typhimurium* glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 4230 *Salmonella typhi* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 88 *Salmonella paratyphi* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 89 *Salmonella paratyphi* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 440 *Salmonella paratyphi* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 441 *Salmonella paratyphi* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 3943 *Salmonella enteritidis* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 4606 *Salmonella dublin* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 4357 *Pseudomonas aeruginosa* glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 610 *Pasteurella multocida* glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_42)  
 2\_7\_7\_42 575 *Neisseria gonorrhoeae* EC-glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)

2\_7\_7\_42 3933 *Mycobacterium tuberculosis* glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 1696 *Mycobacterium leprae* PROBABLE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 1265 *Mycobacterium bovis* EC-glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 5799 *Klebsiella pneumoniae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 5800 *Klebsiella pneumoniae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 5801 *Klebsiella pneumoniae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 5803 *Klebsiella pneumoniae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 5804 *Klebsiella pneumoniae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 152 *Haemophilus influenzae* HI0069 GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_42 528 *Haemophilus ducreyi* EC-glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_42)  
 2\_7\_7\_42 5809 *Escherichia coli* glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_42)  
 2\_7\_7\_42 685 *Corynebacterium diphtheriae* GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_42)  
 2\_7\_7\_42 4130 *Bordetella pertussis* EC-glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE  
 (EC 2\_7\_7\_42)  
 2\_7\_7\_42 8574 *Bordetella bronchiseptica* EC-glnE GLUTAMATE-AMMONIA-LIGASE  
 ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)  
 2\_7\_7\_46 626 *Klebsiella pneumoniae* 2"-AMINOGLYCOSIDE NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_46)  
 2\_7\_7\_47 1120 *Salmonella typhimurium* aadA STREPTOMYCIN 3"-ADENYLYLTRANSFERASE (EC  
 2\_7\_7\_47)  
 2\_7\_7\_47 5698 *Salmonella paratyphi* STREPTOMYCIN 3"-ADENYLYLTRANSFERASE (EC 2\_7\_7\_47)  
 2\_7\_7\_47 419 *Klebsiella pneumoniae* STREPTOMYCIN 3"-ADENYLYLTRANSFERASE (EC 2\_7\_7\_47)  
 2\_7\_7\_47 2350 *Enterococcus faecalis* streptomycin 3"-adenylyltransferase (EC 2\_7\_7\_47) - *Escherichia coli*  
 2\_7\_7\_53 2264 *Saccharomyces cerevisiae* APA2 5',5"-P-1,P-4-TETRAPHOSPHATE PHOSPHORYLASE II (EC  
 2\_7\_7\_53)  
 2\_7\_7\_59 6550 *Yersinia pseudotuberculosis* EC-glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC  
 2\_7\_7\_59)  
 2\_7\_7\_59 1300 *Yersinia pestis* EC-glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 6036 *Vibrio cholerae* El Tor N16961 ORF02865 [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC  
 2\_7\_7\_59)  
 2\_7\_7\_59 1270 *Salmonella typhimurium* glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3765 *Salmonella typhi* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 1597 *Salmonella paratyphi* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3918 *Salmonella paratyphi* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 2669 *Salmonella enteritidis* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3051 *Salmonella dublin* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3153 *Pseudomonas aeruginosa* glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 1475 *Pasteurella multocida* glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 903 *Neisseria gonorrhoeae* EC-glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 754 *Mycobacterium tuberculosis* glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3145 *Mycobacterium leprae* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 3643 *Mycobacterium bovis* EC-glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 5932 *Klebsiella pneumoniae* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 5934 *Klebsiella pneumoniae* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 5935 *Klebsiella pneumoniae* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 14682 *Haemophilus influenzae* HI1719 [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 106 *Haemophilus ducreyi* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 107 *Haemophilus ducreyi* EC-glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 4363 *Escherichia coli* glnD [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 57 *Corynebacterium diphtheriae* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 2029 *Bordetella pertussis* [PROTEIN-P<sub>II</sub>] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)

2\_7\_7\_59 4128 *Bordetella pertussis* EC-glnD [PROTEIN-PII] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_7\_59 8644 *Bordetella bronchiseptica* EC-glnD [PROTEIN-PII] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)  
 2\_7\_8\_1 560 *Treponema pallidum* TP0671 ETHANOLAMINEPHOSPHOTRANSFERASE (EC 2\_7\_8\_1)  
 2\_7\_8\_1 2142 *Saccharomyces cerevisiae* EPT1 ETHANOLAMINEPHOSPHOTRANSFERASE (EC 2\_7\_8\_1)  
 2\_7\_8\_13 7940 *Yersinia pseudotuberculosis* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1165 *Yersinia pestis* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 6171 *Vibrio cholerae* El Tor N16961 ORF03041 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 885 *Treponema pallidum* TP0345 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1518 *Streptococcus pyogenes* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 341 *Streptococcus pneumoniae* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 392 *Streptococcus mutans* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1199 *Streptococcus equi* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 2450 *Staphylococcus aureus* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 2370 *Salmonella typhimurium* murX PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 2475 *Salmonella typhi* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 3899 *Salmonella paratyphi* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 4343 *Salmonella dublin* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 574 *Rickettsia prowazekii* RP595 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 4753 *Pseudomonas aeruginosa* mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1146 *Porphyromonas gingivalis* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 583 *Pasteurella multocida* mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1597 *Neisseria gonorrhoeae* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 2414 *Mycobacterium tuberculosis* murX PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1935 *Mycobacterium leprae* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1993 *Klebsiella pneumoniae* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1994 *Klebsiella pneumoniae* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1415 *Helicobacter pylori* HP0493 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 449 *Helicobacter pylori* J99sp|Q9ZLY1 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 9667 *Haemophilus influenzae* HI1135 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1418 *Haemophilus ducreyi* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 87 *Escherichia coli* mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 3460 *Enterococcus faecium* (DOE) EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1935 *Enterococcus faecalis* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)

2\_7\_8\_13 591 *Corynebacterium diphtheriae* PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1162 *Clostridium difficile* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1790 *Clostridium acetobutylicum* 20589677\_C2\_46 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 726 *Chlamydia trachomatis* D/UW-3/Cx EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 966 *Chlamydia pneumoniae* AR39 CP0966 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 832 *Chlamydia pneumoniae* CWL029 EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 212 *Campylobacter jejuni* mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 438 *Borrelia burgdorferi* BB0303 PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1255 *Bordetella pertussis* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 7510 *Bordetella bronchiseptica* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_13 1520 *Bacillus subtilis* mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)  
 2\_7\_8\_20 1794 *Salmonella typhimurium* mdoB PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 1556 *Salmonella typhi* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 2749 *Salmonella paratyphi* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 2750 *Salmonella paratyphi* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 2815 *Salmonella enteritidis* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 2167 *Salmonella dublin* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 222 *Pseudomonas aeruginosa* PA1115 PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 7519 *Klebsiella pneumoniae* PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_20 6461 *Escherichia coli* mdoB PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)  
 2\_7\_8\_23 4666 *Salmonella dublin* PUTATIVE CARBOXYVINYL-CARBOXYPHOSPHONATE PHOSPHORYLMUTASE (EC 2\_7\_8\_23)  
 2\_7\_8\_23 5661 *Bordetella bronchiseptica* CARBOXYVINYL-CARBOXYPHOSPHONATE PHOSPHORYLMUTASE (EC 2\_7\_8\_23)  
 2\_7\_8\_5 5889 *Yersinia pseudotuberculosis* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1063 *Yersinia pestis* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 4608 *Yersinia pestis* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5040 *Vibrio cholerae* El Tor N16961 ORF01576 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5466 *Vibrio cholerae* El Tor N16961 ORF02132 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5731 *Vibrio cholerae* El Tor N16961 ORF02442 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 504 *Ureaplasma urealyticum* UU364 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 855 *Treponema pallidum* TP0256 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1061 *Streptococcus pyogenes* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1743 *Streptococcus pneumoniae* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1088 *Streptococcus mutans* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1493 *Streptococcus equi* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 4619 *Salmonella typhimurium* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)

2\_7\_8\_5 5108 *Salmonella typhi* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 3968 *Salmonella paratyphi* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 3969 *Salmonella paratyphi* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2285 *Saccharomyces cerevisiae* YKR070W CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 6680 *Saccharomyces cerevisiae* PGS1 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 48 *Rickettsia prowazekii* RP049 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2929 *Pseudomonas aeruginosa* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 6516 *Pseudomonas aeruginosa* PA2541 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 56 *Pasteurella multocida* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1677 *Pasteurella multocida* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1025 *Neisseria gonorrhoeae* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 580 *Mycoplasma pneumoniae* MP580 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2321 *Mycoplasma genitalium* MG114 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 271 *Mycobacterium tuberculosis* pgsA2 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5267 *Mycobacterium tuberculosis* pgsA3 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1831 *Mycobacterium leprae* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2929 *Mycobacterium leprae*trjO32921 PUTATIVE CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYL-TRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 335 *Mycobacterium bovis* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1987 *Mycobacterium bovis* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 4469 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 4470 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 422 *Helicobacter pylori* HP1016 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 409 *Helicobacter pylori* J99 pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 292 *Haemophilus influenzae* HI0123 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 438 *Haemophilus ducreyi* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1368 *Escherichia coli* b1408 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5082 *Escherichia coli* b1758 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 5174 *Escherichia coli* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 984 *Enterococcus faecium* (DOE) PUTATIVE CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYL-TRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 3738 *Enterococcus faecium* (DOE) EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2034 *Enterococcus faecalis* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)



2\_7\_8\_5 1116 *Corynebacterium diphtheriae* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2003 *Corynebacterium diphtheriae* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2442 *Clostridium difficile* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 3563 *Clostridium acetobutylicum* 4150093\_C2\_10 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 763 *Chlamydia trachomatis* D/UW-3/Cx EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 979 *Chlamydia trachomatis* D/UW-3/Cx CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 132 *Chlamydia pneumoniae* AR39 CP0132 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 912 *Chlamydia pneumoniae* AR39 CP0912 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 562 *Chlamydia pneumoniae* CWL029 pgsA\_1 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 875 *Chlamydia pneumoniae* CWL029 pgsA\_2 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 2879 *Campylobacter jejuni* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 868 *Borrelia burgdorferi* BB0721 CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 3728 *Bordetella pertussis* EC-pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_5 1692 *Bacillus subtilis* pgsA CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_5)  
 2\_7\_8\_6 4143 *Vibrio cholerae* El Tor N16961 ORF00365 UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 103 *Streptococcus pneumoniae* BS-yvfC UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 6479 *Salmonella typhimurium* rfbP UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1012 *Salmonella typhi* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 5133 *Salmonella typhi* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1945 *Salmonella paratyphi* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1946 *Salmonella paratyphi* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 6183 *Salmonella paratyphi* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 2638 *Salmonella enteritidis* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 2718 *Salmonella dublin* UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 263 *Pasteurella multocida* rfbP UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1387 *Neisseria gonorrhoeae* BS-yvfC UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 662 *Mycobacterium tuberculosis* Rv1505c UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 916 *Mycobacterium bovis* BS-yvfD UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 9140 *Haemophilus influenzae* HI0872 UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 5242 *Escherichia coli* b2047 UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 2328 *Enterococcus faecium* (DOE) UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)

2\_7\_8\_6 3878 *Enterococcus faecium* (DOE) UNDECAPRENYL-PHOSPHATE  
 GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1136 *Clostridium acetobutylicum* 22557967\_C2\_42 UNDECAPRENYL-PHOSPHATE  
 GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1214 *Clostridium acetobutylicum* 36620175\_C3\_60 UNDECAPRENYL-PHOSPHATE  
 GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_6 1588 *Campylobacter jejuni* wlaI UNDECAPRENYL-PHOSPHATE  
 GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6) FRAMESHIFT  
 2\_7\_8\_6 3420 *Bacillus subtilis* yvfC UNDECAPRENYL-PHOSPHATE  
 GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)  
 2\_7\_8\_7 1716 *Yersinia pestis* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 6214 *Vibrio cholerae* El Tor N16961 ORF03106 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 612 *Treponema pallidum* TP0828 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 806 *Streptococcus pyogenes* acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 967 *Streptococcus pneumoniae* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 1256 *Streptococcus mutans* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 1929 *Streptococcus equi* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 5782 *Salmonella typhimurium* dpj HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 4722 *Salmonella paratyphi* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 1460 *Salmonella enteritidis* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 4080 *Salmonella dublin* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 559 *Rickettsia prowazekii* RP577 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 1369 *Neisseria gonorrhoeae* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 539 *Mycoplasma pneumoniae* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 390 *Mycoplasma genitalium* MG211\_1 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 3197 *Mycobacterium tuberculosis* acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 1598 *Mycobacterium leprae*sp|Q9X7E3 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 3302 *Mycobacterium bovis* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 4576 *Klebsiella pneumoniae* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 231 *Helicobacter pylori* HP0808 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 743 *Helicobacter pylori* J99sp|Q9ZL36 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 5549 *Escherichia coli* acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 86 *Enterococcus faecalis* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 3 *Corynebacterium diphtheriae* HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 1909 *Clostridium difficile* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 230 *Clostridium acetobutylicum* 10728752\_C1\_93 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE  
 (EC 2\_7\_8\_7)  
 2\_7\_8\_7 98 *Chlamydia trachomatis* D/UW-3/Cx acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 445 *Chlamydia pneumoniae* AR39 CP0445 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 279 *Chlamydia pneumoniae* CWL029 acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 662 *Campylobacter jejuni* acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 745 *Borrelia burgdorferi* BB0010 HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 3725 *Bordetella pertussis* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_7 5792 *Bordetella bronchiseptica* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC  
 2\_7\_8\_7)  
 2\_7\_8\_7 462 *Bacillus subtilis* ydcB HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)  
 2\_7\_8\_8 5969 *Yersinia pseudotuberculosis* EC-pssA CDP-DIACYLGLYCEROL--SERINE O-  
 PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 4500 *Yersinia pestis* EC-pssA CDP-DIACYLGLYCEROL--SERINE O-  
 PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 4190 *Vibrio cholerae* El Tor N16961 ORF00445 CDP-DIACYLGLYCEROL--SERINE O-  
 PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 5075 *Salmonella typhimurium* pss CDP-DIACYLGLYCEROL--SERINE O-  
 PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)

2\_7\_8\_8 1275 *Salmonella typhi* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 3029 *Salmonella paratyphi* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 3030 *Salmonella paratyphi* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1496 *Salmonella enteritidis* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 3247 *Salmonella dublin* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 6716 *Saccharomyces cerevisiae* CHO1 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 236 *Rickettsia prowazekii* RP242 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 3442 *Pseudomonas aeruginosa* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 5981 *Pseudomonas aeruginosa* PA3857 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1613 *Porphyromonas gingivalis* BS-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1130 *Pasteurella multocida* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 781 *Neisseria gonorrhoeae* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 4980 *Mycobacterium tuberculosis* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1813 *Mycobacterium leprae* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1858 *Mycobacterium bovis* BS-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 850 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 851 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1601 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 475 *Helicobacter pylori* HP1071 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 358 *Helicobacter pylori* J99 pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 911 *Haemophilus influenzae* HI0425 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1442 *Haemophilus ducreyi* EC-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 2525 *Escherichia coli* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 2230 *Clostridium acetobutylicum* 16839050\_C1\_18 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 2595 *Clostridium acetobutylicum* 6561\_F2\_1 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 790 *Chlamydia trachomatis* D/UW-3/Cx BS-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 873 *Chlamydia pneumoniae* AR39 CP0873 CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 909 *Chlamydia pneumoniae* CWL029 BS-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 1604 *Campylobacter jejuni* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 3075 *Bordetella pertussis* BS-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)  
 2\_7\_8\_8 8805 *Bordetella bronchiseptica* CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)

- 2\_7\_8\_8 228 *Bacillus subtilis* pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLTRANSFERASE (EC 2\_7\_8\_8)
- 2\_7\_9\_1 494 *Treponema pallidum* TP0746 PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 370 *Streptococcus pyogenes* PYRUVATE,PHOSPHATE DIKINASE PRECURSOR (EC 2\_7\_9\_1)
- 2\_7\_9\_1 478 *Rickettsia prowazekii* RP492 PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 187 *Porphyromonas gingivalis* PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 331 *Porphyromonas gingivalis* PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 2265 *Mycobacterium tuberculosis* ppdK PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 2657 *Mycobacterium leprae*trjO05566 PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 959 *Mycobacterium bovis* PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 2648 *Enterococcus faecalis* PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_1 3100 *Clostridium difficile* PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_2 7957 *Yersinia pseudotuberculosis* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2167 *Yersinia pestis* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 7487 *Vibrio cholerae* El Tor N16961ORFA00741 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1410 *Streptococcus pneumoniae* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 7004 *Salmonella typhimurium* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1616 *Salmonella typhi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2327 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2328 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2330 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2331 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 5491 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 690 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1665 *Salmonella dublin* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 3814 *Pseudomonas aeruginosa* ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 464 *Neisseria gonorrhoeae* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 3697 *Mycobacterium tuberculosis* Rv2047c PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2525 *Mycobacterium leprae*trjO32934 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2960 *Mycobacterium leprae* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 3432 *Mycobacterium bovis* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 6181 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 6418 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 6419 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1078 *Helicobacter pylori* HP0121 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 115 *Helicobacter pylori* J99sp|Q9ZMV4 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 5049 *Escherichia coli* ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 278 *Clostridium difficile* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 946 *Clostridium acetobutylicum* 3931625\_C1\_31 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2227 *Clostridium acetobutylicum* 12968767\_C3\_24 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2228 *Clostridium acetobutylicum* 24417508\_C2\_20 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 2231 *Clostridium acetobutylicum* 5122015\_C3\_22 PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 677 *Campylobacter jejuni* Cj1418c PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1489 *Bordetella pertussis* PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 4168 *Bordetella pertussis* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 7662 *Bordetella bronchiseptica* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 1881 *Bacillus subtilis* pps PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_7\_9\_2 3514 *Bacillus subtilis* yvkC PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_8\_1\_6 7843 *Yersinia pseudotuberculosis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 3238 *Yersinia pestis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 5402 *Yersinia pestis* BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 4938 *Vibrio cholerae* El Tor N16961 ORF01454 BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 1383 *Staphylococcus aureus* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 1582 *Salmonella typhimurium* BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 1584 *Salmonella typhimurium* BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 3589 *Salmonella typhi* BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_1\_6 150 *Salmonella paratyphi* BIOTIN SYNTHASE (EC 2\_8\_1\_6)

- 2\_8\_1\_6 5052 *Salmonella enteritidis* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1038 *Salmonella dublin* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 8006 *Saccharomyces cerevisiae* BIO2 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3612 *Pseudomonas aeruginosa* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 603 *Porphyromonas gingivalis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1394 *Pasteurella multocida* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 630 *Neisseria gonorrhoeae* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3171 *Mycobacterium tuberculosis* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3089 *Mycobacterium leprae* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3189 *Mycobacterium bovis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1927 *Klebsiella pneumoniae* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 793 *Helicobacter pylori* HP1406 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1287 *Helicobacter pylori* J99sp|Q9ZJK8 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 2168 *Haemophilus influenzae* HI1022 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1117 *Haemophilus ducreyi* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 742 *Escherichia coli* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1508 *Corynebacterium diphtheriae* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 1920 *Corynebacterium diphtheriae* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 302 *Clostridium difficile* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 303 *Clostridium difficile* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3307 *Clostridium difficile* BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 739 *Clostridium acetobutylicum* 33281550\_F2\_24 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 808 *Chlamydia pneumoniae* AR39 CP0808 BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 966 *Chlamydia pneumoniae* CWL029 bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 506 *Campylobacter jejuni* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 2402 *Bordetella pertussis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 5454 *Bordetella bronchiseptica* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_1\_6 3014 *Bacillus subtilis* bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)  
 2\_8\_2\_22 2571 *Salmonella typhimurium* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 2573 *Salmonella typhimurium* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 3010 *Salmonella typhi* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 701 *Salmonella paratyphi* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 702 *Salmonella paratyphi* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 703 *Salmonella paratyphi* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 1732 *Salmonella enteritidis* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_2\_22 3020 *Salmonella dublin* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)  
 2\_8\_3\_1 1651 *Escherichia coli* ydiF propionate CoA-transferase (EC 2\_8\_3\_1)  
 2\_8\_3\_12 4714 *Pseudomonas aeruginosa* PA0227 GLUTACONATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_12)  
 2\_8\_3\_12 6208 *Pseudomonas aeruginosa* PA0226 GLUTACONATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_12)  
 2\_8\_3\_12 2815 *Mycobacterium tuberculosis* Rv3551 GLUTACONATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_12)  
 2\_8\_3\_12 2822 *Mycobacterium tuberculosis* Rv3552 GLUTACONATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_12)  
 2\_8\_3\_12 536 *Mycobacterium bovis* GLUTACONATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_12)  
 2\_8\_3\_12 537 *Mycobacterium bovis* GLUTACONATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_12)  
 2\_8\_3\_3 7781 *Pseudomonas aeruginosa* mdcA malonate CoA-transferase (EC 2\_8\_3\_3) / malonyl-CoA decarboxylase (EC 4\_1\_1\_9)  
 2\_8\_3\_6 5462 *Pseudomonas aeruginosa* PA2000 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 4595 *Mycobacterium tuberculosis* scoB 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 1984 *Mycobacterium leprae* EC-atoA 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 2795 *Mycobacterium bovis* BS-yxjE 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 1368 *Klebsiella pneumoniae* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 6863 *Klebsiella pneumoniae* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 850 *Bordetella pertussis* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_6)  
 2\_8\_3\_6 2931 *Bordetella pertussis* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 2979 *Bordetella pertussis* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_6)

- 2\_8\_3\_6 4252 *Bordetella pertussis* BS-yxjE 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 7472 *Bordetella bronchiseptica* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_6)  
 2\_8\_3\_6 8413 *Bordetella bronchiseptica* EC-atoA 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 8419 *Bordetella bronchiseptica* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT A (EC 2\_8\_3\_6)  
 2\_8\_3\_6 8420 *Bordetella bronchiseptica* 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_6 3891 *Bacillus subtilis* yxjE 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)  
 2\_8\_3\_8 1502 *Bordetella pertussis* butyryl-CoA:acetate coenzyme A transferase (EC 2\_8\_3\_8)  
 2\_8\_3\_8 1970 *Bacillus subtilis* yodS ACETATE COA-TRANSFERASE ALPHA SUBUNIT (EC 2\_8\_3\_8)  
 2\_8\_3\_9 1522 *Porphyromonas gingivalis* EC-atoA BUTYRATE-ACETOACETATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_9)  
 2\_8\_3\_9 1499 *Clostridium difficile* BUTYRATE-ACETOACETATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_9)  
 2\_8\_3\_9 673 *Clostridium acetobutylicum* 22677217\_F2\_17 BUTYRATE-ACETOACETATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_9)  
 2\_8\_3\_9 1969 *Bacillus subtilis* yodR BUTYRATE-ACETOACETATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_9)  
 2\_9\_1\_1 7835 *Yersinia pseudotuberculosis* EC-selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 890 *Yersinia pestis* EC-selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 4804 *Salmonella typhimurium* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 5966 *Salmonella typhimurium* selA L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 6782 *Salmonella typhimurium* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 901 *Salmonella typhi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3428 *Salmonella typhi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 4606 *Salmonella typhi* L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 878 *Salmonella paratyphi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 879 *Salmonella paratyphi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 880 *Salmonella paratyphi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 2377 *Salmonella paratyphi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 6311 *Salmonella paratyphi* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 974 *Salmonella enteritidis* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1982 *Salmonella enteritidis* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3816 *Salmonella enteritidis* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1839 *Salmonella dublin* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3010 *Salmonella dublin* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3629 *Salmonella dublin* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 7363 *Pseudomonas aeruginosa* selA L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 786 *Pasteurella multocida* selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1280 *Klebsiella pneumoniae* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1281 *Klebsiella pneumoniae* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1282 *Klebsiella pneumoniae* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1283 *Klebsiella pneumoniae* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 5069 *Klebsiella pneumoniae* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 893 *Helicobacter pylori* HP1513 L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1393 *Helicobacter pylori* J99tr/Q9ZJA7 L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 5177 *Haemophilus influenzae* HI0708 L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 1196 *Haemophilus ducreyi* EC-selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 5971 *Escherichia coli* yhfS L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 6529 *Escherichia coli* selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3030 *Enterococcus faecium* (DOE) L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 333 *Enterococcus faecalis* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 2374 *Enterococcus faecalis* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 2941 *Clostridium difficile* L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 3357 *Clostridium difficile* EC-selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 2\_9\_1\_1 617 *Campylobacter jejuni* selA L-SERYL-TRNA(SER) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)  
 3\_1\_1\_10 5017 *Yersinia pestis* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 4835 *Salmonella typhi* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 4155 *Salmonella paratyphi* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 1391 *Pasteurella multocida* TROPINESTERASE (EC 3\_1\_1\_10)

3\_1\_1\_10 1540 *Mycobacterium tuberculosis* lipV TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 2279 *Mycobacterium tuberculosis* bpoB TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 2790 *Mycobacterium tuberculosis* Rv3591c TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 3214 *Mycobacterium leprae* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 963 *Mycobacterium bovis* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 2153 *Mycobacterium bovis* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 3348 *Mycobacterium bovis* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 14256 *Haemophilus influenzae* HI0193 TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 609 *Haemophilus ducreyi* TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_10 4592 *Escherichia coli* b0686 TROPINESTERASE (EC 3\_1\_1\_10)  
 3\_1\_1\_11 4009 *Yersinia pestis* PECTINESTERASE A PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 2658 *Salmonella typhimurium* ybhC PECTINESTERASE B PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 1527 *Salmonella typhi* PECTINESTERASE B PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 673 *Salmonella paratyphi* PECTINESTERASE B PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 196 *Salmonella enteritidis* PECTINESTERASE B PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 4621 *Escherichia coli* ybhC PECTINESTERASE B PRECURSOR (EC 3\_1\_1\_11)  
 3\_1\_1\_11 3188 *Enterococcus faecium* (DOE) PECTINESTERASE (EC 3\_1\_1\_11)  
 3\_1\_1\_11 213 *Clostridium acetobutylicum* 25660963\_C3\_124 PECTINESTERASE (EC 3\_1\_1\_11)  
 3\_1\_1\_17 3906 *Salmonella typhimurium* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_17 1602 *Salmonella paratyphi* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_17 740 *Salmonella enteritidis* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_17 3504 *Salmonella dublin* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_17 892 *Pasteurella multocida* GLUCONOLACTONASE PRECURSOR (EC 3\_1\_1\_17)  
 3\_1\_1\_17 7341 *Klebsiella pneumoniae* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_17 7933 *Klebsiella pneumoniae* GLUCONOLACTONASE PRECURSOR (EC 3\_1\_1\_17)  
 3\_1\_1\_17 8445 *Klebsiella pneumoniae* GLUCONOLACTONASE (EC 3\_1\_1\_17)  
 3\_1\_1\_20 3532 *Klebsiella pneumoniae* TANNASE PRECURSOR (EC 3\_1\_1\_20)  
 3\_1\_1\_20 3533 *Klebsiella pneumoniae* TANNASE PRECURSOR (EC 3\_1\_1\_20)  
 3\_1\_1\_24 533 *Streptococcus mutans* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 1082 *Staphylococcus aureus* 3-OXOADIPATE ENOL-LACTONASE I (EC 3\_1\_1\_24)  
 3\_1\_1\_24 3641 *Staphylococcus aureus* 3-OXOADIPATE ENOL-LACTONASE I (EC 3\_1\_1\_24)  
 3\_1\_1\_24 2129 *Pseudomonas aeruginosa* pcaD 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 5732 *Pseudomonas aeruginosa* PA0480 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 7719 *Pseudomonas aeruginosa* PA3226 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 1237 *Mycobacterium leprae* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 5196 *Klebsiella pneumoniae* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 2209 *Bordetella pertussis* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 2934 *Bordetella pertussis* BS-yisY 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 8423 *Bordetella bronchiseptica* BS-yisY 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_24 9626 *Bordetella bronchiseptica* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)  
 3\_1\_1\_41 319 *Bacillus subtilis* cah CEPHALOSPORIN-C DEACETYLASE (EC 3\_1\_1\_41)  
 3\_1\_1\_45 5384 *Yersinia pseudotuberculosis* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 1749 *Yersinia pestis* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 5826 *Salmonella typhimurium* ysgA PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 2272 *Salmonella enteritidis* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 2769 *Salmonella dublin* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 7745 *Saccharomyces cerevisiae* YDL086W PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 1413 *Pseudomonas aeruginosa* PA2682 CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 6588 *Escherichia coli* b3830 PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 4134 *Bordetella pertussis* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 5085 *Bordetella bronchiseptica* CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_45 8354 *Bordetella bronchiseptica* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)  
 3\_1\_1\_57 1506 *Yersinia pestis* Q9ZC43 2-PYRONE-4,6-DICARBOXYLATE LACTONASE (EC 3\_1\_1\_57)  
 3\_1\_1\_57 1445 *Campylobacter jejuni* Cj0556 2-PYRONE-4,6-DICARBOXYLATE LACTONASE (EC 3\_1\_1\_57)  
 3\_1\_1\_57 2168 *Bordetella pertussis* 2-PYRONE-4,6-DICARBOXYLATE LACTONASE (EC 3\_1\_1\_57)  
 3\_1\_1\_57 6020 *Bordetella bronchiseptica* 2-PYRONE-4,6-DICARBOXYLATE LACTONASE (EC 3\_1\_1\_57)  
 3\_1\_1\_61 4947 *Yersinia pseudotuberculosis* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)

3\_1\_1\_61 2901 *Yersinia pestis* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5226 *Vibrio cholerae* El Tor N16961 ORF01801 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5856 *Vibrio cholerae* El Tor N16961 ORF02604 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 7693 *Vibrio cholerae* El Tor N16961 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 594 *Treponema pallidum* TP0631 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 239 *Salmonella typhimurium* hnr PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 4726 *Salmonella typhimurium* cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 743 *Salmonella typhi* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 1244 *Salmonella paratyphi* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 1245 *Salmonella paratyphi* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 6245 *Salmonella paratyphi* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 3453 *Salmonella enteritidis* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 3255 *Salmonella dublin* PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 704 *Pseudomonas aeruginosa* PA0414 PILI CHEMOTAXIS PROTEIN METHYL ESTERASE CHEB HOMOLOG (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5224 *Pseudomonas aeruginosa* PA1459 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5753 *Pseudomonas aeruginosa* PA0173 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 6784 *Pseudomonas aeruginosa* PA3703 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5154 *Escherichia coli* cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 2167 *Clostridium difficile* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 2695 *Clostridium acetobutylicum* 5986510\_C2\_24 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 2821 *Clostridium acetobutylicum* 26173437\_F2\_4 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 1908 *Campylobacter jejuni* cheB' PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 188 *Borrelia burgdorferi* BB0568 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 335 *Borrelia burgdorferi* BB0415 PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 3355 *Bordetella pertussis* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 5693 *Bordetella bronchiseptica* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_61 1642 *Bacillus subtilis* cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)  
 3\_1\_1\_72 970 *Streptococcus pneumoniae* acetylxytan esterase (EC 3\_1\_1\_72)  
 3\_1\_1\_72 1170 *Streptococcus equi* acetylxytan esterase (EC 3\_1\_1\_72)  
 3\_1\_1\_72 1162 *Enterococcus faecalis* acetylxytan esterase (EC 3\_1\_1\_72)  
 3\_1\_1\_72 2119 *Enterococcus faecalis* acetylxytan esterase (EC 3\_1\_1\_72)  
 3\_1\_11\_1 6283 *Yersinia pseudotuberculosis* EC-sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 3299 *Yersinia pestis* EC-sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 5059 *Vibrio cholerae* El Tor N16961 ORF01598 EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 4226 *Salmonella typhimurium* sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 5131 *Salmonella typhi* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 5536 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 7389 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 1843 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 2632 *Salmonella dublin* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 1817 *Pseudomonas aeruginosa* sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 1568 *Pasteurella multocida* sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 7776 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 7777 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 7778 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 2905 *Haemophilus influenzae* HI1377 EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 1001 *Haemophilus ducreyi* EC-sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_1 1959 *Escherichia coli* sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_11\_1)  
 3\_1\_11\_3 1657 *Salmonella typhi* EXONUCLEASE (EC 3\_1\_11\_3)  
 3\_1\_11\_3 4514 *Escherichia coli* b0539 EXONUCLEASE (EC 3\_1\_11\_3)  
 3\_1\_11\_3 373 *Bordetella pertussis* EXONUCLEASE (EC 3\_1\_11\_3)  
 3\_1\_11\_3 9236 *Bordetella bronchiseptica* EXONUCLEASE (EC 3\_1\_11\_3)  
 3\_1\_11\_5 4547 *Yersinia pseudotuberculosis* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)



3\_1\_11\_5 4897 *Yersinia pseudotuberculosis* EC-recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 7136 *Yersinia pseudotuberculosis* EC-recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 7600 *Yersinia pseudotuberculosis* EC-recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1068 *Yersinia pestis* EC-recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1570 *Yersinia pestis* EC-recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1572 *Yersinia pestis* EC-recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 6087 *Vibrio cholerae* El Tor N16961 ORF02938 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 6088 *Vibrio cholerae* El Tor N16961 ORF02941 EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 6090 *Vibrio cholerae* El Tor N16961 ORF02943 EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 697 *Streptococcus pyogenes* BS-yrnC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 27 *Streptococcus pneumoniae* BS-yrnC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1132 *Streptococcus mutans* BS-yrnC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 456 *Streptococcus equi* BS-yrnC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1772 *Staphylococcus aureus* BS-yrnC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1308 *Salmonella typhimurium* rorA EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 4986 *Salmonella typhimurium* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 4991 *Salmonella typhimurium* recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5556 *Salmonella typhimurium* recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2707 *Salmonella typhi* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3279 *Salmonella typhi* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3280 *Salmonella typhi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 58 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1087 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1088 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1089 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1090 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1091 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1092 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1093 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3676 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3677 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3678 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3679 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3145 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3655 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5148 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1035 *Salmonella dublin* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2781 *Salmonella dublin* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3510 *Salmonella dublin* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 325 *Pseudomonas aeruginosa* recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3322 *Pseudomonas aeruginosa* recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 8231 *Pseudomonas aeruginosa* recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1328 *Porphyromonas gingivalis* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1523 *Pasteurella multocida* recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1524 *Pasteurella multocida* recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1754 *Pasteurella multocida* recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 20215 *Neurospora crassa* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 125 *Neisseria gonorrhoeae* EC-recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 367 *Neisseria gonorrhoeae* EC-pspE EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)

3\_1\_11\_5 1001 *Neisseria gonorrhoeae* EC-recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1992 *Neisseria gonorrhoeae* EC-recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2061 *Mycobacterium tuberculosis* recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5281 *Mycobacterium tuberculosis* recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5282 *Mycobacterium tuberculosis* recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1067 *Mycobacterium bovis* EC-recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1407 *Mycobacterium bovis* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1409 *Mycobacterium bovis* EC-recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3384 *Mycobacterium bovis* EC-recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 895 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2184 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2186 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2187 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2692 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2693 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3907 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3908 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3910 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3911 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3912 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3913 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3914 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3915 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 3916 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5602 *Haemophilus influenzae* HI0942 EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 6395 *Haemophilus influenzae* HI1322 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 10055 *Haemophilus influenzae* HI1321 EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 240 *Haemophilus ducreyi* EC-recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1061 *Haemophilus ducreyi* EC-recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1372 *Haemophilus ducreyi* EC-recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5675 *Escherichia coli* recD EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5676 *Escherichia coli* recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 5678 *Escherichia coli* recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1562 *Enterococcus faecium* (DOE) EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2314 *Enterococcus faecalis* BS-yrrC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2119 *Clostridium difficile* BS-yrrC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2719 *Clostridium acetobutylicum* 19961068\_F3\_4 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 32 *Chlamydia trachomatis* D/UW-3/Cx BS-yrrC EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 610 *Chlamydia trachomatis* D/UW-3/Cx recB EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 611 *Chlamydia trachomatis* D/UW-3/Cx recC EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 623 *Chlamydia trachomatis* D/UW-3/Cx recD\_2 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 7 *Chlamydia pneumoniae* AR39 CP0007 EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 8 *Chlamydia pneumoniae* AR39 CP0008 EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 650 *Chlamydia pneumoniae* AR39 CP0650 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)

3\_1\_11\_5 1120 *Chlamydia pneumoniae* AR39 CP1120 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 1111 *Chlamydia pneumoniae* CWL029 BS-*ymC* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 678 *Chlamydia pneumoniae* CWL029 *recC* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 679 *Chlamydia pneumoniae* CWL029 *recB* EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 691 *Chlamydia pneumoniae* CWL029 *recD\_2* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 125 *Borrelia burgdorferi* BB0634 EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 127 *Borrelia burgdorferi* BB0633 EXODEOXYRIBONUCLEASE V BETA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 128 *Borrelia burgdorferi* BB0632 EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_5 2740 *Bacillus subtilis* *ymC* EXODEOXYRIBONUCLEASE V ALPHA CHAIN (EC 3\_1\_11\_5)  
 3\_1\_11\_6 4498 *Yersinia pseudotuberculosis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 7443 *Yersinia pseudotuberculosis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 995 *Yersinia pestis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4519 *Yersinia pestis* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4788 *Yersinia pestis* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4621 *Vibrio cholerae* El Tor N16961 ORF01026 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4737 *Vibrio cholerae* El Tor N16961 ORF01183 EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 544 *Streptococcus pyogenes* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 545 *Streptococcus pyogenes* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 48 *Streptococcus pneumoniae* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 49 *Streptococcus pneumoniae* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1448 *Streptococcus mutans* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1449 *Streptococcus mutans* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1045 *Streptococcus equi* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1051 *Streptococcus equi* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1905 *Staphylococcus aureus* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3365 *Staphylococcus aureus* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1978 *Salmonella typhimurium* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 5130 *Salmonella typhimurium* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3297 *Salmonella typhi* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3879 *Salmonella typhi* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 654 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 5036 *Salmonella paratyphi* EXODEOXYRIBONUCLEASE SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2123 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3984 *Salmonella enteritidis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4382 *Salmonella dublin* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 344 *Rickettsia prowazekii* RP350 EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 649 *Rickettsia prowazekii* RP675 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 5449 *Pseudomonas aeruginosa* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 6665 *Pseudomonas aeruginosa* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1475 *Porphyromonas gingivalis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)

3\_1\_11\_6 83 *Pasteurella multocida* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 713 *Pasteurella multocida* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1346 *Neisseria gonorrhoeae* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1536 *Neisseria gonorrhoeae* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4273 *Mycobacterium tuberculosis* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4274 *Mycobacterium tuberculosis* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2824 *Mycobacterium lepraetr*[Q9X784 EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2825 *Mycobacterium lepraetr*[Q9X783 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 978 *Mycobacterium bovis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 979 *Mycobacterium bovis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1068 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4430 *Klebsiella pneumoniae* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1206 *Helicobacter pylori* HP0259 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 248 *Helicobacter pylori* J99tr[Q9ZMH7 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 855 *Haemophilus influenzae* HI0397 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3019 *Haemophilus influenzae* HI1437 EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 103 *Haemophilus ducreyi* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 104 *Haemophilus ducreyi* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2449 *Escherichia coli* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4464 *Escherichia coli* xseB EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1516 *Enterococcus faecium* (DOE) EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 1525 *Enterococcus faecium* (DOE) EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2960 *Enterococcus faecalis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2961 *Enterococcus faecalis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 793 *Corynebacterium diphtheriae* EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2547 *Corynebacterium diphtheriae* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3048 *Clostridium difficile* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3049 *Clostridium difficile* EXODEOXYRIBONUCLEASE SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3468 *Clostridium acetobutylicum* 20735887\_F3\_4 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 3469 *Clostridium acetobutylicum*.9869050\_F3\_5 EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 314 *Chlamydia trachomatis* D/UW-3/Cx EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 315 *Chlamydia trachomatis* D/UW-3/Cx EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 787 *Chlamydia pneumoniae* AR39 CP0787 EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 788 *Chlamydia pneumoniae* AR39 CP0788 EXODEOXYRIBONUCLEASE SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 983 *Chlamydia pneumoniae* CWL029 EXODEOXYRIBONUCLEASE SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 984 *Chlamydia pneumoniae* CWL029 EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2290 *Campylobacter jejuni* xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)

- 3\_1\_11\_6 1932 *Bordetella pertussis* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 4097 *Bordetella pertussis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 6243 *Bordetella bronchiseptica* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 6810 *Bordetella bronchiseptica* EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2424 *Bacillus subtilis* yqiC EXODEOXYRIBONUCLEASE VII SMALL SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_11\_6 2425 *Bacillus subtilis* yqiB EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_11\_6)  
 3\_1\_13\_4 1035 *Saccharomyces cerevisiae* PAN3 PAB-DEPENDENT POLY(A)-SPECIFIC RIBONUCLEASE SUBUNIT PAN3 (EC 3\_1\_13\_4)  
 3\_1\_13\_4 3663 *Saccharomyces cerevisiae* PAN2 PAB-DEPENDENT POLY(A)-SPECIFIC RIBONUCLEASE SUBUNIT PAN2 (EC 3\_1\_13\_4)  
 3\_1\_2\_14 431 *Streptococcus pyogenes* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_2\_14 554 *Streptococcus pneumoniae* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_2\_14 1277 *Streptococcus mutans* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_2\_14 757 *Streptococcus equi* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_2\_14 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3- HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL- CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER- PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14) ]  
 3\_1\_2\_14 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2213 *Enterococcus faecalis* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_2\_14 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 3\_1\_2\_14 2421 *Clostridium acetobutylicum* 4465\_F3\_6 OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)  
 3\_1\_21\_2 4558 *Yersinia pseudotuberculosis* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 4286 *Yersinia pestis* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 6127 *Vibrio cholerae* El Tor N16961 ORF02989 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 442 *Ureaplasma urealyticum* UU306 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2543 *Staphylococcus aureus* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2050 *Salmonella typhimurium* nfo ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 593 *Salmonella typhi* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2465 *Salmonella paratyphi* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 631 *Salmonella dublin* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 5087 *Pseudomonas aeruginosa* PA0238 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 509 *Mycoplasma pneumoniae* MP509 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2543 *Mycoplasma genitalium* MG235 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 337 *Mycobacterium tuberculosis* Rv0498 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 4777 *Mycobacterium tuberculosis* end ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 1413 *Mycobacterium leprae* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 3018 *Mycobacterium leprae* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 1840 *Mycobacterium bovis* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 3243 *Mycobacterium bovis* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 925 *Klebsiella pneumoniae* ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 1073 *Haemophilus ducreyi* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2108 *Escherichia coli* nfo ENDONUCLEASE IV (EC 3\_1\_21\_2)

- 3\_1\_21\_2 683 *Enterococcus faecium* (DOE) BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 3530 *Clostridium difficile* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2434 *Clostridium acetobutylicum* 204837\_C1\_21 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2767 *Clostridium acetobutylicum* 10634382\_F2\_8 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 595 *Chlamydia trachomatis* D/UW-3/Cx nfo ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 14 *Chlamydia pneumoniae* AR39 CP0014 ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 673 *Chlamydia pneumoniae* CWL029 nfo ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_2 2507 *Bacillus subtilis* yqfS ENDONUCLEASE IV (EC 3\_1\_21\_2)  
 3\_1\_21\_3 4292 *Yersinia pseudotuberculosis* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 5150 *Yersinia pseudotuberculosis* TYPE I RESTRICTION ENZYME ECOR124II R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 (ECOR124/3 I) (EC 3\_1\_21\_3), specificity subunit  
 3\_1\_21\_3 494 *Streptococcus pyogenes* hsdR TYPE I RESTRICTION ENZYME ECOR124II R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 843 *Streptococcus pneumoniae* EC-hsdR TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 1580 *Streptococcus pneumoniae* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 (ECOR124/3 I) (EC 3\_1\_21\_3), specificity subunit  
 3\_1\_21\_3 3373 *Salmonella typhimurium* hsr TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 3376 *Salmonella typhimurium* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 342 *Salmonella typhi* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 2612 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 2613 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 2614 *Salmonella paratyphi* TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 5307 *Salmonella enteritidis* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 4195 *Salmonella dublin* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 999 *Pasteurella multocida* hsdR TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 880 *Neisseria gonorrhoeae* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 205 *Mycoplasma pneumoniae* TYPE I RESTRICTION ENZYME (EC 3\_1\_21\_3)  
 3\_1\_21\_3 490 *Mycoplasma pneumoniae* MP490 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 492 *Mycoplasma pneumoniae* MP492 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 791 *Helicobacter pylori* HP1402 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 1386 *Helicobacter pylori* HP0464 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 418 *Helicobacter pylori* J99 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 419 *Helicobacter pylori* J99 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 783 *Helicobacter pylori* J99tr[Q9ZK28 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 1412 *Helicobacter pylori* J99 hsdR\_3 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 4131 *Haemophilus influenzae* HI0218 TYPE I RESTRICTION ENZYME PRRD (EC 3\_1\_21\_3)  
 3\_1\_21\_3 15554 *Haemophilus influenzae* HI1285 TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 6454 *Escherichia coli* hsdR TYPE I RESTRICTION ENZYME ECOK I R PROTEIN (EC 3\_1\_21\_3)  
 3\_1\_21\_3 1813 *Corynebacterium diphtheriae* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 2031 *Campylobacter jejuni* Cj1549c TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_21\_3)  
 3\_1\_21\_3 2034 *Campylobacter jejuni* Cj1551c type I restriction enzyme Cfl (EC 3\_1\_21\_3), specificity subunit  
 3\_1\_21\_4 154 *Ureaplasma urealyticum* UU036 TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_21\_4)  
 3\_1\_21\_4 2144 *Streptococcus pneumoniae* TYPE II RESTRICTION ENZYME DPNI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 2163 *Streptococcus mutans* TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_21\_4)  
 3\_1\_21\_4 1342 *Streptococcus equi* TYPE IIS RESTRICTION ENZYME FOKI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 1817 *Streptococcus equi* TYPE II RESTRICTION ENZYME BSUBI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 6212 *Salmonella typhimurium* TYPE IIS RESTRICTION ENZYME (EC 3\_1\_21\_4) (EC 2\_1\_1\_72)  
 3\_1\_21\_4 2009 *Porphyromonas gingivalis* TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_21\_4)  
 3\_1\_21\_4 696 *Neisseria gonorrhoeae* TYPE II RESTRICTION ENZYME HPHI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 923 *Neisseria gonorrhoeae* TYPE II RESTRICTION ENZYME DPNI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 2049 *Neisseria gonorrhoeae* TYPE II RESTRICTION ENZYME NLAIV (EC 3\_1\_21\_4)  
 3\_1\_21\_4 2081 *Neisseria gonorrhoeae* TYPE II RESTRICTION ENZYME NGOMI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 9457 *Haemophilus influenzae* HI1040 TYPE II RESTRICTION ENZYME HGIDI (EC 3\_1\_21\_4)  
 3\_1\_21\_4 15264 *Haemophilus influenzae* HI1393 TYPE II RESTRICTION ENZYME HINDIII (EC 3\_1\_21\_4)  
 3\_1\_21\_4 20835 *Haemophilus influenzae* HI0512 TYPE II RESTRICTION ENZYME HINCII (EC 3\_1\_21\_4)  
 3\_1\_21\_4 27 *Clostridium acetobutylicum* 35312755\_C1\_163 TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_21\_4)

3\_1\_21\_4 3994 *Clostridium acetobutylicum* 4110427\_C3\_2 TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_21\_4)  
 3\_1\_21\_5 2715 *Salmonella typhimurium* res TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 135 *Salmonella typhi* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 3731 *Salmonella paratyphi* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 1265 *Salmonella enteritidis* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 921 *Salmonella dublin* TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 828 *Pasteurella multocida* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 1250 *Neisseria gonorrhoeae* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 1397 *Helicobacter pylori* J99tr|Q9ZJA3 TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 546 *Haemophilus ducreyi* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_21\_5 9386 *Bordetella bronchiseptica* TYPE III RESTRICTION-MODIFICATION SYSTEM ECOPI ENZYME RES (EC 3\_1\_21\_5)  
 3\_1\_22\_4 7017 *Yersinia pseudotuberculosis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 4544 *Yersinia pestis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 5644 *Vibrio cholerae* El Tor N16961 ORF02336 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 233 *Treponema pallidum* TP0517 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 4097 *Salmonella typhimurium* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 2599 *Salmonella typhi* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 3399 *Salmonella paratyphi* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 3400 *Salmonella paratyphi* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 1134 *Salmonella enteritidis* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 3983 *Salmonella dublin* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 117 *Rickettsia prowazekii* RP119 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 8002 *Pseudomonas aeruginosa* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 764 *Porphyromonas gingivalis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 1771 *Pasteurella multocida* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 1270 *Neisseria gonorrhoeae* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 488 *Mycobacterium tuberculosis* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 51 *Mycobacterium lepraesp|P40834* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 2767 *Mycobacterium leprae* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 1431 *Mycobacterium bovis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)  
 3\_1\_22\_4 4557 *Klebsiella pneumoniae* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUVC (EC 3\_1\_22\_4)

3\_1\_22\_4 296 *Helicobacter pylori* HP0877 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV  
 (EC 3\_1\_22\_4)  
 3\_1\_22\_4 810 *Helicobacter pylori* J99sp|Q9ZKX3 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE  
 RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 13968 *Haemophilus influenzae* HI0314 CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE  
 RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 214 *Haemophilus ducreyi* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE  
 RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 5141 *Escherichia coli* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV (EC  
 3\_1\_22\_4)  
 3\_1\_22\_4 20 *Corynebacterium diphtheriae* CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV  
 (EC 3\_1\_22\_4)  
 3\_1\_22\_4 2010 *Clostridium difficile* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE  
 RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 477 *Chlamydia trachomatis* D/UW-3/Cx EC-ruvC CROSSOVER JUNCTION  
 ENDODEOXYRIBONUCLEASE RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 126 *Chlamydia pneumoniae* AR39 CP0126 CROSSOVER JUNCTION  
 ENDODEOXYRIBONUCLEASE RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 568 *Chlamydia pneumoniae* CWL029 EC-ruvC CROSSOVER JUNCTION  
 ENDODEOXYRIBONUCLEASE RUV (EC 3\_1\_22\_4)  
 3\_1\_22\_4 1086 *Campylobacter jejuni* ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV  
 (EC 3\_1\_22\_4)  
 3\_1\_22\_4 4317 *Bordetella pertussis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV  
 (EC 3\_1\_22\_4)  
 3\_1\_25\_1 1460 *Pasteurella multocida* ENDONUCLEASE V (EC 3\_1\_25\_1)  
 3\_1\_25\_1 496 *Haemophilus ducreyi* ENDONUCLEASE V (EC 3\_1\_25\_1)  
 3\_1\_25\_1 3688 *Bordetella pertussis* ENDONUCLEASE V (EC 3\_1\_25\_1)  
 3\_1\_25\_1 7312 *Bordetella bronchiseptica* ENDONUCLEASE V (EC 3\_1\_25\_1)  
 3\_1\_27\_1 3086 *Saccharomyces cerevisiae* RNY1 RIBONUCLEASE TRV (EC 3\_1\_27\_1)  
 3\_1\_27\_3 1446 *Corynebacterium diphtheriae* GUANYL-SPECIFIC RIBONUCLEASE SA3 (EC 3\_1\_27\_3)  
 3\_1\_27\_6 890 *Salmonella typhimurium* msa RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 2027 *Salmonella typhi* RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 3548 *Salmonella paratyphi* RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 2029 *Salmonella enteritidis* RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 4635 *Salmonella dublin* RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 8330 *Klebsiella pneumoniae* RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_27\_6 4545 *Escherichia coli* rna RIBONUCLEASE I PRECURSOR (EC 3\_1\_27\_6)  
 3\_1\_3\_10 1010 *Salmonella typhimurium* agp GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 4633 *Salmonella typhi* GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 1829 *Salmonella paratyphi* GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 1923 *Salmonella enteritidis* GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 4446 *Salmonella dublin* GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 6825 *Klebsiella pneumoniae* GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_10 965 *Escherichia coli* agp GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)  
 3\_1\_3\_12 2803 *Salmonella typhimurium* otsB TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2354 *Salmonella typhi* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2957 *Salmonella paratyphi* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2958 *Salmonella paratyphi* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 3887 *Salmonella enteritidis* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2709 *Salmonella dublin* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 88 *Saccharomyces cerevisiae* TPS2 TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 6025 *Mycobacterium tuberculosis* otsB2 TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 1207 *Mycobacterium leprae* EC-otsB TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 511 *Mycobacterium bovis* EC-otsB TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2678 *Klebsiella pneumoniae* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2679 *Klebsiella pneumoniae* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 5167 *Escherichia coli* otsB TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 2036 *Enterococcus faecalis* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_12 1361 *Corynebacterium diphtheriae* TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)  
 3\_1\_3\_15 7520 *Yersinia pseudotuberculosis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 362 *Yersinia pestis* EC-hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)



3\_1\_3\_15 2284 *Yersinia pestis* EC-yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 4754 *Vibrio cholerae* El Tor N16961 ORF01207 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 4961 *Vibrio cholerae* El Tor N16961 ORF01480 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 1370 *Streptococcus mutans* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 507 *Salmonella typhimurium* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 5582 *Salmonella typhimurium* yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1207 *Salmonella typhi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-  
 PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 4364 *Salmonella typhi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 639 *Salmonella paratyphi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1578 *Salmonella paratyphi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1579 *Salmonella paratyphi* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 / HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 294 *Salmonella enteritidis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-  
 PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 664 *Salmonella enteritidis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 2216 *Saccharomyces cerevisiae* HIS2 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 2057 *Pseudomonas aeruginosa* PA0006 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1096 *Pasteurella multocida* EC-yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1892 *Pasteurella multocida* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 719 *Neisseria gonorrhoeae* EC-yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 5463 *Mycobacterium tuberculosis* Rv0114 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 4653 *Mycobacterium bovis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 3963 *Klebsiella pneumoniae* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 9270 *Klebsiella pneumoniae* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 280 *Helicobacter pylori* HP0860 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 793 *Helicobacter pylori* J99trjQ9ZKY8 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1006 *Haemophilus influenzae* HI0471 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 1345 *Haemophilus influenzae* sp|P46452 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 565 *Haemophilus ducreyi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 566 *Haemophilus ducreyi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 200 *Escherichia coli* yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1970 *Escherichia coli* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-  
 PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 2150 *Enterococcus faecium* (DOE) HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 515 *Clostridium difficile* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 2894 *Clostridium difficile* PROBABLE HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 3312 *Clostridium difficile* BS-ytvP HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 548 *Clostridium acetobutylicum* 7062510\_C3\_88 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 1130 *Clostridium acetobutylicum* 20709663\_C1\_38 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 895 *Campylobacter jejuni* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) /  
 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 3\_1\_3\_15 1541 *Campylobacter jejuni* Cj1152c HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 3926 *Bordetella pertussis* EC-yaeD HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_15 2956 *Bacillus subtilis* ytvP HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 3\_1\_3\_27 4737 *Yersinia pseudotuberculosis* EC-ggpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC  
 3\_1\_3\_27)  
 3\_1\_3\_27 7440 *Yersinia pseudotuberculosis* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 456 *Yersinia pestis* EC-ggpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2734 *Yersinia pestis* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 6039 *Vibrio cholerae* El Tor N16961 ORF02869 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC  
 3\_1\_3\_27)  
 3\_1\_3\_27 6245 *Vibrio cholerae* El Tor N16961 ORF03144 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC  
 3\_1\_3\_27)  
 3\_1\_3\_27 6554 *Vibrio cholerae* El Tor N16961 ORFA00938 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC  
 3\_1\_3\_27)  
 3\_1\_3\_27 1861 *Streptococcus pyogenes* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1695 *Streptococcus pneumoniae* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)

3\_1\_3\_27 263 *Streptococcus mutans* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 523 *Streptococcus equi* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2158 *Staphylococcus aureus* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 3107 *Staphylococcus aureus* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2863 *Salmonella typhimurium* pgpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 5136 *Salmonella typhimurium* pgpA PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 829 *Salmonella typhi* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2437 *Salmonella typhi* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 5045 *Salmonella paratyphi* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 6128 *Salmonella paratyphi* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1711 *Salmonella enteritidis* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1975 *Salmonella enteritidis* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 309 *Salmonella dublin* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 533 *Salmonella dublin* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 722 *Rickettsia prowazekii* RP750 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 841 *Rickettsia prowazekii* RP870 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 6660 *Pseudomonas aeruginosa* pgpA PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 857 *Pasteurella multocida* pgpA PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1611 *Pasteurella multocida* pdpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 280 *Neisseria gonorrhoeae* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 3441 *Mycobacterium tuberculosis* Rv0308 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 266 *Mycobacterium bovis* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1100 *Klebsiella pneumoniae* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 3513 *Klebsiella pneumoniae* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 164 *Helicobacter pylori* HP0737 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 271 *Helicobacter pylori* HP0851 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 674 *Helicobacter pylori* J99trQ9ZLA6 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2775 *Haemophilus influenzae* HI1306 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 17818 *Haemophilus influenzae* HI0211 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 663 *Haemophilus ducreyi* EC-pgpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 769 *Haemophilus ducreyi* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 402 *Escherichia coli* b0418 PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1238 *Escherichia coli* pgpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 2283 *Enterococcus faecium* (DOE) PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 3856 *Enterococcus faecium* (DOE) PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1715 *Enterococcus faecalis* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1122 *Corynebacterium diphtheriae* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1465 *Corynebacterium diphtheriae* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1769 *Clostridium difficile* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 559 *Clostridium acetobutylicum* 1464762\_C3\_45 PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 915 *Campylobacter jejuni* pgpA PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 1680 *Bordetella pertussis* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_27 3714 *Bordetella pertussis* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 8926 *Bordetella bronchiseptica* PHOSPHATIDYLGLYCEROPHOSPHATASE A (EC 3\_1\_3\_27)  
 3\_1\_3\_27 9201 *Bordetella bronchiseptica* PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)  
 3\_1\_3\_33 4737 *Saccharomyces cerevisiae* CTL1 POLYNUCLEOTIDE 5'-TRIPHOSPHATASE (EC 3\_1\_3\_33)  
 3\_1\_3\_43 5464 *Saccharomyces cerevisiae* PTC5 [PYRUVATE DEHYDROGENASE (LIPOAMIDE) (PDP) (EC 3\_1\_3\_43)  
 3\_1\_3\_68 324 *Saccharomyces cerevisiae* DOG1 2-DEOXYGLUCOSE-6-PHOSPHATE PHOSPHATASE 1 (EC 3\_1\_3\_68)  
 3\_1\_3\_68 4035 *Saccharomyces cerevisiae* DOG2 2-DEOXYGLUCOSE-6-PHOSPHATE PHOSPHATASE 2 (EC 3\_1\_3\_68)  
 3\_1\_30\_2 6201 *Salmonella typhimurium* NUCLEASE PRECURSOR (EC 3\_1\_30\_2)  
 3\_1\_30\_2 4249 *Salmonella typhi* NUCLEASE PRECURSOR (EC 3\_1\_30\_2)  
 3\_1\_30\_2 3546 *Salmonella paratyphi* NUCLEASE PRECURSOR (EC 3\_1\_30\_2)  
 3\_1\_30\_2 2491 *Salmonella enteritidis* NUCLEASE PRECURSOR (EC 3\_1\_30\_2)  
 3\_1\_30\_2 670 *Salmonella dublin* NUCLEASE PRECURSOR (EC 3\_1\_30\_2)  
 3\_1\_31\_1 407 *Staphylococcus aureus* THERMONUCLEASE PRECURSOR (EC 3\_1\_31\_1)

3\_1\_31\_1 5715 *Salmonella typhi* MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 2375 *Pseudomonas aeruginosa* PA3727 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 8080 *Pseudomonas aeruginosa* PA5048 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 1702 *Pasteurella multocida* MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 7435 *Klebsiella pneumoniae* THERMONUCLEASE PRECURSOR (EC 3\_1\_31\_1)  
 3\_1\_31\_1 1269 *Helicobacter pylori* HP0323 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 310 *Helicobacter pylori* J99tr|Q9ZMB5 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 11872 *Haemophilus influenzae* HI1296 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 950 *Enterococcus faecalis* MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 3484 *Clostridium acetobutylicum* 35322143\_C1\_8 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 3830 *Clostridium acetobutylicum* 25523427\_F2\_1 MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 1830 *Campylobacter jejuni* Cj0979c MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 1762 *Bacillus subtilis* yncB MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_31\_1 2159 *Bacillus subtilis* yokF MICROCOCCAL NUCLEASE (EC 3\_1\_31\_1)  
 3\_1\_4\_14 6761 *Yersinia pseudotuberculosis* EC-acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 3891 *Yersinia pestis* EC-acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 6244 *Salmonella typhimurium* acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4973 *Salmonella typhi* [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 1161 *Pseudomonas aeruginosa* acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 6043 *Pseudomonas aeruginosa* PA0785 [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 6146 *Pseudomonas aeruginosa* PA1962 [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4450 *Mycoplasma genitalium* MG333 [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4627 *Klebsiella pneumoniae* [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4628 *Klebsiella pneumoniae* [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 11678 *Haemophilus influenzae* HI1366 ACYL CARRIER PROTEIN PHOSPHODIESTERASE (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4903 *Escherichia coli* acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 3170 *Enterococcus faecium* (DOE) [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 221 *Enterococcus faecalis* [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 2610 *Clostridium difficile* EC-acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 560 *Clostridium acetobutylicum* 1367202\_C1\_40 [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 4472 *Clostridium acetobutylicum* PUTATIVE ACYL CARRIER PROTEIN PHOSPHODIESTERASE (EC 3\_1\_4\_14)  
 3\_1\_4\_14 3602 *Bordetella pertussis* EC-acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 7296 *Bordetella bronchiseptica* [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 1921 *Bacillus subtilis* yocJ [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_14 3349 *Bacillus subtilis* yvaB [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)  
 3\_1\_4\_16 7144 *Yersinia pseudotuberculosis* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1233 *Yersinia pestis* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 6182 *Vibrio cholerae* El Tor N16961 ORF03055 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 6314 *Vibrio cholerae* El Tor N16961 ORF03247 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 818 *Streptococcus mutans* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1414 *Staphylococcus aureus* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 2996 *Staphylococcus aureus* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 3247 *Staphylococcus aureus* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 330 *Salmonella typhimurium* cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 2954 *Salmonella typhi* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 4377 *Salmonella paratyphi* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 4378 *Salmonella paratyphi* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)

3\_1\_4\_16 4379 *Salmonella paratyphi* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 4380 *Salmonella paratyphi* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1501 *Salmonella enteritidis* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 3659 *Salmonella dublin* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 952 *Porphyromonas gingivalis* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1237 *Pasteurella multocida* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 6653 *Klebsiella pneumoniae* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1061 *Helicobacter pylori* HP0104 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 100 *Helicobacter pylori* J99tr|Q9ZMW9 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 13456 *Haemophilus influenzae* HI0583 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 6378 *Escherichia coli* cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 454 *Enterococcus faecalis* 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 741 *Enterococcus faecalis* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_16 1596 *Clostridium acetobutylicum* 4863787\_F1\_2 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 3261 *Clostridium acetobutylicum* 245452\_C2\_12 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 784 *Bacillus subtilis* yfkN 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE (EC 3\_1\_4\_16)  
 3\_1\_4\_16 918 *Bacillus subtilis* yhcR 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)  
 3\_1\_4\_3 2654 *Staphylococcus aureus* PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 410 *Pseudomonas aeruginosa* plcH HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 1818 *Pseudomonas aeruginosa* plcN NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 1330 *Mycobacterium tuberculosis* plcC NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 1331 *Mycobacterium tuberculosis* plcB NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 1332 *Mycobacterium tuberculosis* plcA NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 2600 *Mycobacterium tuberculosis* plcD NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 3063 *Mycobacterium leprae* NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 3979 *Mycobacterium bovis*tr|Q9XB13 NON-HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_4\_3 3406 *Clostridium acetobutylicum* 25595038\_F3\_4 PHOSPHOLIPASE C (EC 3\_1\_4\_3)  
 3\_1\_4\_3 3797 *Clostridium acetobutylicum* 9861558\_F2\_2 PHOSPHOLIPASE C (EC 3\_1\_4\_3)  
 3\_1\_4\_3 1814 *Bordetella pertussis* HEMOLYTIC PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)  
 3\_1\_5\_1 7234 *Yersinia pseudotuberculosis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)  
 3\_1\_5\_1 2059 *Yersinia pestis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)  
 3\_1\_5\_1 5774 *Vibrio cholerae* El Tor N16961 ORF02497 DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)  
 3\_1\_5\_1 6819 *Vibrio cholerae* El Tor N16961 ORFA01278 DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)  
 3\_1\_5\_1 1964 *Salmonella typhimurium* dgt DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)  
 3\_1\_5\_1 1960 *Salmonella typhi* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)

- 3\_1\_5\_1 3926 *Salmonella paratyphi* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 3927 *Salmonella paratyphi* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 4163 *Salmonella dublin* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 63 *Rickettsia prowazekii* RP064 DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 6937 *Pseudomonas aeruginosa* dgt DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 7767 *Pseudomonas aeruginosa* PA3043 DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 883 *Porphyromonas gingivalis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 1699 *Pasteurella multocida* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 1325 *Mycobacterium tuberculosis* dgt DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 60 *Mycobacterium leprae* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 2078 *Mycobacterium bovis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 2912 *Klebsiella pneumoniae* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 2769 *Haemophilus influenzae* H11299 DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 6359 *Haemophilus influenzae* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 160 *Escherichia coli* dgt DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 1504 *Enterococcus faecalis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 1447 *Corynebacterium diphtheriae* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 4161 *Bordetella pertussis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 4934 *Bordetella bronchiseptica* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_5\_1 8121 *Bordetella bronchiseptica* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_6\_6 559 *Pseudomonas aeruginosa* betC CHOLINE-SULFATASE (EC 3\_1\_6\_6)
- 3\_1\_6\_6 8786 *Bordetella bronchiseptica* CHOLINE-SULFATASE (EC 3\_1\_6\_6)
- 3\_1\_6\_6 9144 *Bordetella bronchiseptica* CHOLINE-SULFATASE (EC 3\_1\_6\_6)
- 3\_1\_7\_2 7363 *Yersinia pseudotuberculosis* BS-relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 2303 *Yersinia pestis* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 6458 *Vibrio cholerae* El Tor N16961 ORF03429 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 418 *Ureaplasma urealyticum* UU283 PROBABLE GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 595 *Streptococcus pyogenes* relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 171 *Streptococcus pneumoniae* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 1746 *Streptococcus pneumoniae* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 1012 *Streptococcus mutans* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_7\_2 1877 *Streptococcus equi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)

3\_1\_7\_2 38 *Staphylococcus aureus* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 6029 *Salmonella typhimurium* spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 2094 *Salmonella typhi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 93 *Salmonella paratyphi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 94 *Salmonella paratyphi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 187 *Salmonella paratyphi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3627 *Salmonella paratyphi* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 306 *Rickettsia prowazekii* RP312 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 602 *Rickettsia prowazekii* RP624 PROBABLE GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 603 *Rickettsia prowazekii* RP625 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3306 *Pseudomonas aeruginosa* PA0431 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 6941 *Pseudomonas aeruginosa* spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1011 *Porphyromonas gingivalis* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1725 *Pasteurella multocida* spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1028 *Neisseria gonorrhoeae* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 442 *Mycoplasma pneumoniae* MP442 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1607 *Mycoplasma genitalium* MG278 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 472 *Mycobacterium tuberculosis* relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 37 *Mycobacterium leprae* sp. Q49640 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1887 *Mycobacterium bovis* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 7952 *Klebsiella pneumoniae* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 7953 *Klebsiella pneumoniae* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 201 *Helicobacter pylori* HP0775 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 712 *Helicobacter pylori* J99 spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 18233 *Haemophilus influenzae* HI1741 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 44 *Haemophilus ducreyi* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3570 *Escherichia coli* spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3000 *Enterococcus faecium* (DOE) GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1791 *Enterococcus faecalis* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1069 *Corynebacterium diphtheriae* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 1921 *Corynebacterium diphtheriae* GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)

3\_1\_7\_2 2459 *Clostridium difficile* BS-relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3002 *Clostridium acetobutylicum* 26757037\_C1\_24 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 3003 *Clostridium acetobutylicum* 26214063\_C1\_23 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 2633 *Campylobacter jejuni* spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 543 *Borrelia burgdorferi* BB0198 GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 4193 *Bordetella pertussis* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 8956 *Bordetella bronchiseptica* EC-spoT GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_1\_7\_2 2753 *Bacillus subtilis* relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)  
 3\_11\_1\_1 7112 *Vibrio cholerae* El Tor N16961ORFA00274 phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 907 *Salmonella typhimurium* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 1623 *Salmonella typhi* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 5021 *Salmonella paratyphi* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 579 *Salmonella enteritidis* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 427 *Salmonella dublin* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 466 *Pseudomonas aeruginosa* phnX phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 8130 *Pseudomonas aeruginosa* PA2803 phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 8359 *Klebsiella pneumoniae* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 609 *Enterococcus faecium* (DOE) phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 396 *Bordetella pertussis* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 1936 *Bordetella pertussis* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_1 1937 *Bordetella pertussis* phosphonoacetaldehyde hydrolase (EC 3\_11\_1\_1)  
 3\_11\_1\_2 5981 *Bordetella bronchiseptica* PHOSPHONOACETATE HYDROLASE (EC 3\_11\_1\_2)  
 3\_2\_1\_11 139 *Streptococcus mutans* DEXTRANASE PRECURSOR (EC 3\_2\_1\_11)  
 3\_2\_1\_122 6142 *Escherichia coli* glvG MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 2566 *Enterococcus faecium* (DOE) MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 186 *Clostridium difficile* EC-glvG MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 1473 *Clostridium difficile* MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 1587 *Clostridium difficile* MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 2246 *Clostridium difficile* MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 3506 *Clostridium difficile* MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 17 *Clostridium acetobutylicum* 24648390\_F2\_51 MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 947 *Clostridium acetobutylicum* 812552\_C2\_35 MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 713 *Bacillus subtilis* lpID MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_122 818 *Bacillus subtilis* glvA MALTOS-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)  
 3\_2\_1\_135 516 *Clostridium difficile* BS-yvdF NEOPULLULANASE (EC 3\_2\_1\_135)  
 3\_2\_1\_135 1042 *Clostridium acetobutylicum* 4462692\_F2\_26 neopullulanase (EC 3\_2\_1\_135)  
 3\_2\_1\_135 1043 *Clostridium acetobutylicum* 14635927\_F1\_9 neopullulanase (EC 3\_2\_1\_135)  
 3\_2\_1\_135 3457 *Bacillus subtilis* yvdF CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54)/NEOPULLULANASE (EC 3\_2\_1\_135)  
 3\_2\_1\_141 1364 *Salmonella typhimurium* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 716 *Salmonella typhi* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 3510 *Salmonella paratyphi* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 3896 *Salmonella enteritidis* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 2335 *Salmonella dublin* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 5452 *Pseudomonas aeruginosa* PA2164 MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 1185 *Mycobacterium tuberculosis* glgZ MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)

3\_2\_1\_141 4 *Mycobacterium bovis* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 1424 *Bordetella pertussis* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_141 9667 *Bordetella bronchiseptica* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)  
 3\_2\_1\_15 1800 *Streptococcus pneumoniae* POLYGALACTURONASE (EC 3\_2\_1\_15)  
 3\_2\_1\_15 959 *Staphylococcus aureus* POLYGALACTURONASE (EC 3\_2\_1\_15)  
 3\_2\_1\_15 2401 *Saccharomyces cerevisiae* PGU1 PROBABLE POLYGALACTURONASE YJR153W PRECURSOR (EC 3\_2\_1\_15)  
 3\_2\_1\_15 663 *Escherichia coli* b0689 POLYGALACTURONASE PRECURSOR (EC 3\_2\_1\_15)  
 3\_2\_1\_15 1871 *Enterococcus faecium* (DOE) POLYGALACTURONASE (EC 3\_2\_1\_15)  
 3\_2\_1\_15 574 *Clostridium acetobutylicum* 30272300\_C1\_41 POLYGALACTURONASE (EC 3\_2\_1\_15)  
 3\_2\_1\_15 2305 *Clostridium acetobutylicum* 188811\_F3\_6 POLYGALACTURONASE (EC 3\_2\_1\_15)  
 3\_2\_1\_26 7161 *Vibrio cholerae* El Tor N16961ORFA00334 SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 118 *Streptococcus pyogenes* scrB SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 925 *Streptococcus pneumoniae* SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 1094 *Streptococcus pneumoniae* BS-sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 134 *Streptococcus mutans* BS-sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 1 *Streptococcus equi* BS-sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 203 *Staphylococcus aureus* BS-sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 3106 *Saccharomyces cerevisiae* SUC2 INVERTASE 2 (EC 3\_2\_1\_26)  
 3\_2\_1\_26 1122 *Pasteurella multocida* scrB SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 6405 *Klebsiella pneumoniae* SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 8027 *Klebsiella pneumoniae* SUCROSE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 651 *Enterococcus faecium* (DOE) BETA-FRUCTOSIDASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 492 *Enterococcus faecalis* SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 1058 *Enterococcus faecalis* SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 114 *Corynebacterium diphtheriae* SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 1056 *Clostridium difficile* BS-sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 599 *Clostridium acetobutylicum* 657827\_C1\_44 SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_26 3797 *Bacillus subtilis* sacA SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)  
 3\_2\_1\_3 661 *Saccharomyces cerevisiae* SGA1 GLUCOAMYLASE, INTRACELLULAR SPORULATION-SPECIFIC (EC 3\_2\_1\_3)  
 3\_2\_1\_3 2103 *Saccharomyces cerevisiae* YMR317W GLUCOAMYLASE S1/S2 (EC 3\_2\_1\_3)  
 3\_2\_1\_3 4278 *Saccharomyces cerevisiae* MUC1 GLUCOAMYLASE S1/S2 (EC 3\_2\_1\_3)  
 3\_2\_1\_3 5542 *Saccharomyces cerevisiae* YDL037C GLUCOAMYLASE S1/S2 (EC 3\_2\_1\_3)  
 3\_2\_1\_3 6869 *Saccharomyces cerevisiae* YJR151C GLUCOAMYLASE S1/S2 (EC 3\_2\_1\_3)  
 3\_2\_1\_3 161 *Neurospora crassa* gla-1 GLUCOAMYLASE PRECURSOR (EC 3\_2\_1\_3)  
 3\_2\_1\_3 20249 *Neurospora crassa* GLUCOAMYLASE (EC 3\_2\_1\_3)  
 3\_2\_1\_3 577 *Mycobacterium tuberculosis* Rv2402 GLUCOAMYLASE G1 AND G2 PRECURSOR (EC 3\_2\_1\_3)  
 3\_2\_1\_3 2347 *Mycobacterium leprae* GLUCOAMYLASE G1 AND G2 PRECURSOR (EC 3\_2\_1\_3)  
 3\_2\_1\_3 2296 *Mycobacterium bovis* GLUCOAMYLASE G1 AND G2 PRECURSOR (EC 3\_2\_1\_3)  
 3\_2\_1\_4 5496 *Yersinia pseudotuberculosis* EC-yhjM ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3516 *Yersinia pestis* EC-yhjM ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 244 *Streptococcus pneumoniae* BS-yhfE ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2194 *Staphylococcus aureus* BS-yhfE ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2723 *Salmonella typhimurium* bcsC ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2742 *Salmonella typhi* ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 886 *Salmonella paratyphi* ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3498 *Salmonella enteritidis* ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3942 *Salmonella dublin* ENDOGLUCANASE PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1964 *Pseudomonas aeruginosa* PA3461 ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2876 *Mycobacterium tuberculosis* Rv1090 ENDOGLUCANASE I PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3522 *Mycobacterium tuberculosis* celA ENDOGLUCANASE A PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 5780 *Mycobacterium tuberculosis* Rv1987 ENDOGLUCANASE E-4 PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 47 *Mycobacterium bovis* ENDOGLUCANASE A PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2050 *Mycobacterium bovis* ENDOGLUCANASE I PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 4529 *Mycobacterium bovis* ENDOGLUCANASE E-4 PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3008 *Klebsiella pneumoniae* ENDOGLUCANASE (EC 3\_2\_1\_4)



3\_2\_1\_4 3009 *Klebsiella pneumoniae* ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 5843 *Klebsiella pneumoniae* ENDOGLUCANASE PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 6063 *Escherichia coli* yhjM ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1437 *Enterococcus faecium* (DOE) ENDOGLUCANASE M (EC 3\_2\_1\_4)  
 3\_2\_1\_4 380 *Clostridium difficile* BS-yhfE ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2852 *Clostridium difficile* ENDOGLUCANASE H PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 103 *Clostridium acetobutylicum* 34417250\_C1\_120 ENDOGLUCANASE D (EC 3\_2\_1\_4)  
 3\_2\_1\_4 173 *Clostridium acetobutylicum* 19532877\_F1\_34 ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 733 *Clostridium acetobutylicum* 36521883\_C3\_59 ENDOGLUCANASE M (EC 3\_2\_1\_4)  
 3\_2\_1\_4 734 *Clostridium acetobutylicum* 14742887\_C2\_50 ENDOGLUCANASE M (EC 3\_2\_1\_4)  
 3\_2\_1\_4 735 *Clostridium acetobutylicum* 1070328\_C3\_58 ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 942 *Clostridium acetobutylicum* 39843\_C2\_37 ENDOGLUCANASE E (EC 3\_2\_1\_4)  
 3\_2\_1\_4 949 *Clostridium acetobutylicum* 30203377\_C3\_76 ENDOGLUCANASE G (EC 3\_2\_1\_4)  
 3\_2\_1\_4 950 *Clostridium acetobutylicum* 23464218\_C3\_75 ENDOGLUCANASE A (EC 3\_2\_1\_4)  
 3\_2\_1\_4 953 *Clostridium acetobutylicum* 7063812\_C1\_59 ENDOGLUCANASE G (EC 3\_2\_1\_4)  
 3\_2\_1\_4 954 *Clostridium acetobutylicum* 24414135\_C1\_58 ENDOGLUCANASE B (EC 3\_2\_1\_4) /  
 EXOGLUCANASE (EC 3\_2\_1\_91)  
 3\_2\_1\_4 955 *Clostridium acetobutylicum* 1204687\_C3\_73 ENDOGLUCANASE F (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1106 *Clostridium acetobutylicum* 13875443\_F2\_24 ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1622 *Clostridium acetobutylicum* 14252318\_C1\_17 ENDOGLUCANASE D (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1624 *Clostridium acetobutylicum* 23675260\_C3\_36 ENDOGLUCANASE D (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2244 *Clostridium acetobutylicum* 23564813\_C2\_29 ENDOGLUCANASE G (EC 3\_2\_1\_4)  
 3\_2\_1\_4 2770 *Clostridium acetobutylicum* 4703218\_C1\_17 ENDOGLUCANASE B (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3429 *Clostridium acetobutylicum* 34188805\_C2\_19 ENDOGLUCANASE G (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3431 *Clostridium acetobutylicum* 9767887\_C1\_16 ENDOGLUCANASE G (EC 3\_2\_1\_4)  
 3\_2\_1\_4 3650 *Clostridium acetobutylicum* 914840\_F3\_3 ENDOGLUCANASE H (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1020 *Bacillus subtilis* yhfE ENDOGLUCANASE (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1812 *Bacillus subtilis* bglC ENDOGLUCANASE PRECURSOR (EC 3\_2\_1\_4)  
 3\_2\_1\_4 1861 *Bacillus subtilis* yoaJ MAJOR EXTRACELLULAR ENDOGLUCANASE PRECURSOR (EC  
 3\_2\_1\_4)  
 3\_2\_1\_4 2876 *Bacillus subtilis* ysdC ENDOGLUCANASE M (EC 3\_2\_1\_4)  
 3\_2\_1\_41 197 *Streptococcus pyogenes* pulA PULLULANASE (EC 3\_2\_1\_41)  
 3\_2\_1\_41 240 *Streptococcus pneumoniae* PULLULANASE (EC 3\_2\_1\_41)  
 3\_2\_1\_41 1354 *Streptococcus pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 684 *Streptococcus equi* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 731 *Streptococcus equi* PULLULANASE (EC 3\_2\_1\_41)  
 3\_2\_1\_41 306 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 2346 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 2347 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 3125 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 3127 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 3128 *Klebsiella pneumoniae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 211 *Corynebacterium diphtheriae* PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 393 *Clostridium difficile* PULLULANASE (EC 3\_2\_1\_41)  
 3\_2\_1\_41 1034 *Clostridium acetobutylicum* 891882\_F1\_5 PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_41 3863 *Clostridium acetobutylicum* 3141500\_C3\_4 PULLULANASE (EC 3\_2\_1\_41)  
 3\_2\_1\_41 2987 *Bacillus subtilis* amyX PULLULANASE PRECURSOR (EC 3\_2\_1\_41)  
 3\_2\_1\_54 769 *Streptococcus pyogenes* amyB CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54)  
 3\_2\_1\_54 1205 *Streptococcus equi* BS-yvdF CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54)  
 3\_2\_1\_54 2146 *Mycobacterium leprae* CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54)  
 3\_2\_1\_54 3457 *Bacillus subtilis* yvdF CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54) / NEOPULLULANASE (EC  
 3\_2\_1\_135)  
 3\_2\_1\_55 2898 *Enterococcus faecium* (DOE) BS-abfA ALPHA-L-ARABINOFURANOSIDASE I (EC 3\_2\_1\_55)  
 3\_2\_1\_55 20 *Clostridium acetobutylicum* 3949092\_F3\_100 ALPHA-L-ARABINOFURANOSIDASE (EC  
 3\_2\_1\_55)  
 3\_2\_1\_55 3970 *Clostridium acetobutylicum* 17038412\_F2\_1 BETA-XYLOSIDASE (EC 3\_2\_1\_37) / ALPHA-L-  
 ARABINOFURANOSIDASE (EC 3\_2\_1\_55)  
 3\_2\_1\_55 2845 *Bacillus subtilis* xsa ALPHA-L-ARABINOFURANOSIDASE (EC 3\_2\_1\_55)  
 3\_2\_1\_55 2866 *Bacillus subtilis* abfA ALPHA-L-ARABINOFURANOSIDASE I (EC 3\_2\_1\_55)  
 3\_2\_1\_58 3283 *Saccharomyces cerevisiae* EXG1 GLUCAN 1,3-BETA-GLUCOSIDASE I/II PRECURSOR (EC  
 3\_2\_1\_58)

3\_2\_1\_58 3959 *Saccharomyces cerevisiae* EXG2 GLUCAN 1,3-BETA-GLUCOSIDASE 2 PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_58 4377 *Saccharomyces cerevisiae* BGL2 GLUCAN 1,3-BETA-GLUCOSIDASE PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_58 6951 *Saccharomyces cerevisiae* SPR1 SPORULATION-SPECIFIC GLUCAN 1,3-BETA-GLUCOSIDASE PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_58 3959 *Pseudomonas aeruginosa* PA1163 GLUCAN 1,3-BETA-GLUCOSIDASE PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_58 20395 *Neurospora crassa* GLUCAN 1,3-BETA-GLUCOSIDASE PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_58 2958 *Clostridium difficile* GLUCAN 1,3-BETA-GLUCOSIDASE I/II PRECURSOR (EC 3\_2\_1\_58)  
 3\_2\_1\_65 3452 *Clostridium acetobutylicum* 23600003\_F1\_2 LEVANASE (EC 3\_2\_1\_65)  
 3\_2\_1\_65 2696 *Bacillus subtilis* sacC LEVANASE (EC 3\_2\_1\_65)  
 3\_2\_1\_65 3441 *Bacillus subtilis* yveB LEVANASE (EC 3\_2\_1\_65)  
 3\_2\_1\_70 48 *Streptococcus pyogenes* dexB GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_70 1375 *Streptococcus pneumoniae* trjO07337 GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_70 1417 *Streptococcus mutans* BS-yvdL GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_70 707 *Streptococcus equi* BS-yvdL GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_70 1389 *Enterococcus faecium* (DOE) GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_70 2606 *Enterococcus faecalis* GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)  
 3\_2\_1\_73 1672 *Streptococcus mutans* EC-yhjM BETA-GLUCANASE PRECURSOR (EC 3\_2\_1\_73)  
 3\_2\_1\_73 478 *Clostridium acetobutylicum* 35320300\_C1\_60 BETA-GLUCANASE (EC 3\_2\_1\_73)  
 3\_2\_1\_73 3900 *Bacillus subtilis* bglS BETA-GLUCANASE PRECURSOR (EC 3\_2\_1\_73)  
 3\_2\_1\_74 2831 *Clostridium acetobutylicum* 35394681\_F1\_1 glucan 1,4-beta-glucosidase (EC 3\_2\_1\_74)  
 3\_2\_1\_78 939 *Clostridium acetobutylicum* 5267842\_C2\_39 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)  
 3\_2\_1\_78 940 *Clostridium acetobutylicum* 34178552\_C1\_33 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)  
 3\_2\_1\_78 941 *Clostridium acetobutylicum* 26361302\_C2\_38 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)  
 3\_2\_1\_78 3531 *Clostridium acetobutylicum* 15785442\_C2\_7 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)  
 3\_2\_1\_78 3532 *Clostridium acetobutylicum* 7308402\_C2\_6 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)  
 3\_2\_1\_78 588 *Bacillus subtilis* ydhT MANNAN ENDO-1,4-BETA-MANNOSIDASE (EC 3\_2\_1\_78)  
 3\_2\_1\_8 6615 *Vibrio cholerae* El Tor N16961ORFA01011 ENDO-1,4-BETA-XYLANASE A PRECURSOR (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1312 *Streptococcus mutans* ENDO-1,4-BETA-XYLANASE B (EC 3\_2\_1\_8)  
 3\_2\_1\_8 8136 *Pseudomonas aeruginosa* PA2783 ENDO-1,4-BETA-XYLANASE A PRECURSOR (EC 3\_2\_1\_8)  
 3\_2\_1\_8 587 *Mycobacterium leprae* ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 4055 *Klebsiella pneumoniae* ENDO-1,4-BETA-XYLANASE Z PRECURSOR (EC 3\_2\_1\_8)  
 3\_2\_1\_8 6161 *Escherichia coli* yieL ENDO-1,4-BETA-XYLANASE Z PRECURSOR (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1650 *Enterococcus faecalis* BS-yjeA ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1151 *Clostridium difficile* ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1189 *Clostridium difficile* ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 996 *Clostridium acetobutylicum* 3995468\_F2\_15 ENDO-1,4-BETA-XYLANASE B (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1158 *Clostridium acetobutylicum* 3386541\_C2\_41 ENDO-1,4-BETA-XYLANASE A (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1161 *Clostridium acetobutylicum* 4725453\_C1\_34 ENDO-1,4-BETA-XYLANASE Z (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1162 *Clostridium acetobutylicum* 26369562\_C3\_47 ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1266 *Clostridium acetobutylicum* 36229625\_F1\_2 ENDO-1,4-BETA-XYLANASE Z (EC 3\_2\_1\_8)  
 3\_2\_1\_8 3497 *Clostridium acetobutylicum* 23631300\_C1\_10 ENDO-1,4-BETA-XYLANASE A (EC 3\_2\_1\_8)  
 3\_2\_1\_8 3558 *Clostridium acetobutylicum* 821093\_F1\_1 ENDO-1,4-BETA-XYLANASE Z (EC 3\_2\_1\_8)  
 3\_2\_1\_8 965 *Bacillus subtilis* yheN ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1211 *Bacillus subtilis* yjeA ENDO-1,4-BETA-XYLANASE D (EC 3\_2\_1\_8)  
 3\_2\_1\_8 1882 *Bacillus subtilis* xynA ENDO-1,4-BETA-XYLANASE A (EC 3\_2\_1\_8)  
 3\_2\_1\_8 3926 *Bacillus subtilis* yxiA ENDO-1,4-BETA-XYLANASE Z (EC 3\_2\_1\_8)  
 3\_2\_1\_80 532 *Streptococcus mutans* FRUCTAN BETA-FRUCTOSIDASE PRECURSOR (EC 3\_2\_1\_80)  
 3\_2\_1\_81 2950 *Pseudomonas aeruginosa* PA1046 BETA-AGARASE B (EC 3\_2\_1\_81)  
 3\_2\_1\_83 51 *Clostridium acetobutylicum* 22439426\_F3\_127 KAPPA-CARRAGEENASE (EC 3\_2\_1\_83)  
 3\_2\_1\_85 168 *Streptococcus pyogenes* lacG 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 144 *Streptococcus pneumoniae* 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 1451 *Streptococcus pneumoniae* 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 1373 *Streptococcus mutans* 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)

3\_2\_1\_85 365 *Staphylococcus aureus* pP11175 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 2998 *Escherichia coli* ebgA 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 2951 *Enterococcus faecium* (DOE) 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 498 *Enterococcus faecalis* 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_85 3038 *Clostridium acetobutylicum* 24805252\_F2\_4 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)  
 3\_2\_1\_86 6489 *Yersinia pseudotuberculosis* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 7889 *Yersinia pseudotuberculosis* EC-celF 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2467 *Yersinia pestis* EC-celF PROBABLE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2518 *Yersinia pestis* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5109 *Vibrio cholerae* El Tor N16961 ORF01667 PROBABLE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5364 *Vibrio cholerae* El Tor N16961 ORF01994 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 395 *Streptococcus pyogenes* bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 494 *Streptococcus pneumoniae* EC-bglB 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 590 *Streptococcus pneumoniae* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 901 *Streptococcus pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 400 *Streptococcus mutans* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1031 *Streptococcus mutans* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1871 *Streptococcus mutans* EC-bglB 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 477 *Streptococcus equi* BS-bglH 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1877 *Staphylococcus aureus* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5305 *Salmonella typhimurium* bglA 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 6186 *Salmonella typhimurium* celF 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 564 *Salmonella typhi* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3604 *Salmonella typhi* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2964 *Salmonella paratyphi* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2965 *Salmonella paratyphi* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 4784 *Salmonella paratyphi* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 241 *Salmonella enteritidis* 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2352 *Salmonella enteritidis* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 949 *Salmonella dublin* 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 4200 *Salmonella dublin* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1669 *Klebsiella pneumoniae* PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3034 *Klebsiella pneumoniae* PROBABLE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3930 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3931 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 4084 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5265 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5490 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5491 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5492 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5653 *Klebsiella pneumoniae* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 7042 *Klebsiella pneumoniae* PROBABLE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 7043 *Klebsiella pneumoniae* PROBABLE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2645 *Escherichia coli* ascB 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 5069 *Escherichia coli* celF 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 6535 *Escherichia coli* bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 6551 *Escherichia coli* bglB 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1705 *Enterococcus faecium* (DOE) 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1706 *Enterococcus faecium* (DOE) 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3825 *Enterococcus faecium* (DOE) 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 490 *Enterococcus faecalis* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 671 *Enterococcus faecalis* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1167 *Enterococcus faecalis* EC-celF 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1192 *Enterococcus faecalis* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1402 *Enterococcus faecalis* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1403 *Enterococcus faecalis* EC-ascB 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 567 *Clostridium difficile* EC-celF 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 973 *Clostridium difficile* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)

3\_2\_1\_86 1123 *Clostridium difficile* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1484 *Clostridium difficile* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2737 *Clostridium difficile* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3491 *Clostridium difficile* BS-bglH 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3492 *Clostridium difficile* 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 307 *Clostridium acetobutylicum* 978437\_C1\_70 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 386 *Clostridium acetobutylicum* 20980052\_F3\_47 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 497 *Clostridium acetobutylicum* 34413187\_C2\_63 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 1894 *Clostridium acetobutylicum* 36225012\_C3\_26 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 2681 *Clostridium acetobutylicum* 10820338\_F1\_3 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 342 *Bacillus subtilis* yckE 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3849 *Bacillus subtilis* lich 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 3919 *Bacillus subtilis* bglH 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_86 4005 *Bacillus subtilis* bglA 6-PHOSPHO-BETA-GLUCOSIDASE (EC 3\_2\_1\_86)  
 3\_2\_1\_89 4501 *Yersinia pseudotuberculosis* ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)  
 3\_2\_1\_89 1119 *Yersinia pestis* BS-yvfO ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)  
 3\_2\_1\_89 7095 *Klebsiella pneumoniae* ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)  
 3\_2\_1\_89 7096 *Klebsiella pneumoniae* ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)  
 3\_2\_1\_89 2952 *Enterococcus faecium* (DOE) BS-yvfO ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)  
 3\_2\_1\_89 3186 *Clostridium acetobutylicum* 20604827\_F1\_1 ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE (EC 3\_2\_1\_89)  
 3\_2\_1\_89 3407 *Bacillus subtilis* yvfO ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE (EC 3\_2\_1\_89)  
 3\_2\_1\_91 101 *Neurospora crassa* CBH-1 EXOGLUCANASE 1 PRECURSOR (EC 3\_2\_1\_91)  
 3\_2\_1\_91 954 *Clostridium acetobutylicum* 24414135\_C1\_58 ENDOGLUCANASE B (EC 3\_2\_1\_4) / EXOGLUCANASE (EC 3\_2\_1\_91)  
 3\_2\_1\_91 2431 *Clostridium acetobutylicum* 33788263\_C2\_30 cellulose 1,4-beta-cellobiosidase (EC 3\_2\_1\_91)  
 3\_2\_1\_93 5327 *Yersinia pseudotuberculosis* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 3394 *Yersinia pestis* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 4757 *Vibrio cholerae* El Tor N16961 ORF01211 TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 508 *Streptococcus pyogenes* dexS TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 558 *Streptococcus pneumoniae* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 1556 *Streptococcus mutans* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 3827 *Staphylococcus aureus* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 5505 *Salmonella typhimurium* olgH TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 850 *Salmonella typhi* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 1451 *Salmonella paratyphi* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 1452 *Salmonella paratyphi* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 2658 *Salmonella enteritidis* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 1310 *Salmonella dublin* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 7048 *Klebsiella pneumoniae* TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 6388 *Escherichia coli* treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 1352 *Enterococcus faecium* (DOE) EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 3496 *Clostridium difficile* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_93 781 *Bacillus subtilis* treA TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)  
 3\_2\_1\_99 2875 *Bacillus subtilis* abnA ARABINAN ENDO-1,5-ALPHA-L-ARABINOSIDASE A (EC 3\_2\_1\_99)  
 3\_2\_2\_1 1353 *Staphylococcus aureus* EC-yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 2631 *Staphylococcus aureus* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)

3\_2\_2\_1 3427 *Salmonella typhimurium* yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 6382 *Salmonella typhimurium* ybeK INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 126 *Salmonella typhi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 4277 *Salmonella typhi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3596 *Salmonella paratyphi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3597 *Salmonella paratyphi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 4886 *Salmonella paratyphi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 7253 *Salmonella paratyphi* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3872 *Salmonella enteritidis* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1489 *Saccharomyces cerevisiae* URH1 INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3245 *Pseudomonas aeruginosa* PA0143 INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 787 *Pasteurella multocida* iunH INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1884 *Mycobacterium tuberculosis* iunH INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1475 *Mycobacterium bovis* EC-ybeK INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 2268 *Mycobacterium bovis* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1890 *Klebsiella pneumoniae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3315 *Klebsiella pneumoniae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3316 *Klebsiella pneumoniae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 30 *Escherichia coli* yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 4573 *Escherichia coli* ybeK INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 5314 *Escherichia coli* yeiK INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1213 *Enterococcus faecium* (DOE) INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 680 *Enterococcus faecalis* EC-yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1320 *Corynebacterium diphtheriae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 1321 *Corynebacterium diphtheriae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 2110 *Corynebacterium diphtheriae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 2120 *Corynebacterium diphtheriae* INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 3250 *Clostridium difficile* EC-yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_1 2316 *Campylobacter jejuni* Cj0340 INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)  
 3\_2\_2\_20 8086 *Yersinia pseudotuberculosis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 2324 *Yersinia pestis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 5471 *Vibrio cholerae* El Tor N16961 ORF02140 DNA-3-METHYLADENINE GLYCOSYLASE I (EC 3\_2\_2\_20)  
 3\_2\_2\_20 629 *Streptococcus pyogenes* tag DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1211 *Streptococcus pneumoniae* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)

3\_2\_2\_20 1561 *Streptococcus mutans* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1564 *Streptococcus equi* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 2558 *Staphylococcus aureus*trjQ9RL93 DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 2340 *Salmonella typhimurium* tag DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 2937 *Salmonella typhi* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 4001 *Salmonella paratyphi* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 4025 *Salmonella enteritidis* DNA-3-METHYLADENINE GLYCOSYLASE I (EC 3\_2\_2\_20)  
 3\_2\_2\_20 562 *Pseudomonas aeruginosa* tag DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 7840 *Pseudomonas aeruginosa* PA1193 DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 358 *Pasteurella multocida* tagI DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 273 *Neisseria gonorrhoeae* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 5079 *Mycobacterium tuberculosis* tagA DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1119 *Mycobacterium lepraetrjQ49957* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 2681 *Mycobacterium bovis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 6632 *Klebsiella pneumoniae* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 16893 *Haemophilus influenzae* HI0654 DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 3469 *Escherichia coli* tag DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1397 *Enterococcus faecalis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1534 *Enterococcus faecalis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 1574 *Corynebacterium diphtheriae* DNA-3-METHYLADENINE GLYCOSYLASE I (EC 3\_2\_2\_20)  
 3\_2\_2\_20 3683 *Bordetella pertussis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_20 6172 *Bordetella bronchiseptica* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)  
 3\_2\_2\_23 5180 *Yersinia pseudotuberculosis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 4844 *Yersinia pestis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 4103 *Vibrio cholerae* El Tor N16961 ORF00315 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 557 *Ureaplasma urealyticum* UU413 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1190 *Streptococcus pyogenes* fpg FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 192 *Streptococcus pneumoniae* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 89 *Streptococcus mutans* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1501 *Streptococcus equi* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1441 *Staphylococcus aureus* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1003 *Salmonella typhimurium* fpg FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1322 *Salmonella typhi* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1035 *Salmonella paratyphi* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1036 *Salmonella paratyphi* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1046 *Salmonella enteritidis* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 662 *Salmonella dublin* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 6992 *Pseudomonas aeruginosa* mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1838 *Pasteurella multocida* fpg FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1674 *Neisseria gonorrhoeae* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 458 *Mycoplasma pneumoniae* MP458 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1575 *Mycoplasma genitalium*sp|P55825 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 51 *Mycobacterium tuberculosis* Rv0944 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2864 *Mycobacterium tuberculosis* nei FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 3096 *Mycobacterium tuberculosis* Rv2464c FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 3983 *Mycobacterium tuberculosis* fpg FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)

3\_2\_2\_23 795 *Mycobacterium leprae* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2234 *Mycobacterium leprae* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2235 *Mycobacterium leprae* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1774 *Mycobacterium bovis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2360 *Mycobacterium bovis* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2398 *Mycobacterium bovis* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2962 *Mycobacterium bovis* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 16255 *Haemophilus influenzae* HI0946 FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1549 *Haemophilus ducreyi* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 6116 *Escherichia coli* mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1250 *Enterococcus faecium* (DOE) FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 540 *Enterococcus faecalis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 148 *Corynebacterium diphtheriae* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 520 *Corynebacterium diphtheriae* FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 1792 *Corynebacterium diphtheriae* PROBABLE FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 4039 *Bordetella pertussis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 5975 *Bordetella bronchiseptica* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_23 2902 *Bacillus subtilis* mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)  
 3\_2\_2\_4 6262 *Yersinia pseudotuberculosis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 380 *Yersinia pestis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 3041 *Salmonella typhimurium* amn AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 4112 *Salmonella typhi* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 939 *Salmonella paratyphi* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 4112 *Salmonella enteritidis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 2761 *Salmonella dublin* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 5153 *Pseudomonas aeruginosa* amn AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 1598 *Porphyromonas gingivalis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 5983 *Klebsiella pneumoniae* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 9198 *Klebsiella pneumoniae* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 1933 *Escherichia coli* amn AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 721 *Chlamydia trachomatis* D/UW-3/Cx amn AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 972 *Chlamydia pneumoniae* AR39 CP0972 AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 826 *Chlamydia pneumoniae* CWL029 amn AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 3841 *Bordetella pertussis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_4 8091 *Bordetella bronchiseptica* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)  
 3\_2\_2\_9 7233 *Yersinia pseudotuberculosis* BS-yrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 2060 *Yersinia pestis* BS-yrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 6146 *Vibrio cholerae* El Tor N16961 ORF03010 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 610 *Ureaplasma urealyticum* UU470 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 315 *Treponema pallidum* TP0170 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 57 *Streptococcus pyogenes* pfs 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 1569 *Streptococcus pneumoniae* BS-yrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 1573 *Streptococcus mutans* BS-yrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)  
 3\_2\_2\_9 577 *Streptococcus equi* BS-yrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)



- 3\_2\_2\_9 2474 *Staphylococcus aureus* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1497 *Salmonella typhimurium* pfs 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1961 *Salmonella typhi* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 3928 *Salmonella paratyphi* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 3929 *Salmonella paratyphi* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 292 *Porphyromonas gingivalis* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 183 *Pasteurella multocida* pfs 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1427 *Neisseria gonorrhoeae* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 568 *Mycobacterium tuberculosis* Rv0091 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 3505 *Mycobacterium bovis* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 2913 *Klebsiella pneumoniae* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1046 *Helicobacter pylori* HP0089 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 83 *Helicobacter pylori* J99sp|Q9ZMY2 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 2595 *Haemophilus influenzae* H11216 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1246 *Haemophilus ducreyi* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 4358 *Escherichia coli* pfs 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 970 *Enterococcus faecium* (DOE) 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1830 *Enterococcus faecalis* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 2791 *Enterococcus faecalis* BS-*yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 3687 *Clostridium difficile* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 2795 *Clostridium acetobutylicum* 9878262\_F1\_4 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 784 *Campylobacter jejuni* pfs 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 167 *Borrelia burgdorferi* BB0588 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 373 *Borrelia burgdorferi* BB0375 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 1179 *Borrelia burgdorferi* BBI06 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_2\_2\_9 2720 *Bacillus subtilis* *yrpU* 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_3\_2\_1 4626 *Vibrio cholerae* El Tor N16961 ORF01033 ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 653 *Streptococcus pneumoniae* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 3222 *Staphylococcus aureus* EC-*yecD* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 3233 *Salmonella typhimurium* entG ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 4104 *Salmonella typhimurium* *yecD* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 3580 *Salmonella typhi* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 4432 *Salmonella typhi* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 931 *Salmonella paratyphi* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 932 *Salmonella paratyphi* ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_3\_2\_1 3526 *Salmonella enteritidis* ISOCHORISMATASE (EC 3\_3\_2\_1)



- 3\_3\_2\_1 3965 *Salmonella enteritidis* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 968 *Salmonella dublin* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2336 *Pseudomonas aeruginosa* PA3953 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 4107 *Pseudomonas aeruginosa* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 5525 *Pseudomonas aeruginosa* PA3066 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 6906 *Pseudomonas aeruginosa* PA3783 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 7491 *Pseudomonas aeruginosa* PA1677 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 8642 *Pseudomonas aeruginosa* PA5507 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2357 *Klebsiella pneumoniae* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 4366 *Klebsiella pneumoniae* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 7168 *Klebsiella pneumoniae* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 9085 *Klebsiella pneumoniae* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 576 *Escherichia coli* entB ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1824 *Escherichia coli* yecD ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 4731 *Escherichia coli* b1011 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1983 *Enterococcus faecium* (DOE) ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2857 *Enterococcus faecium* (DOE) ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 3848 *Enterococcus faecium* (DOE) ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2643 *Enterococcus faecalis* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1077 *Clostridium difficile* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1628 *Clostridium difficile* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1629 *Clostridium difficile* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 99 *Clostridium acetobutylicum* 19689005\_C1\_121 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 329 *Clostridium acetobutylicum* 26601580\_F3\_58 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 404 *Clostridium acetobutylicum* 26460885\_F3\_56 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2740 *Campylobacter jejuni* Cj0119 ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 605 *Bordetella pertussis* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 1611 *Bordetella pertussis* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 8300 *Bordetella bronchiseptica* ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 17 *Bacillus subtilis* yaaI ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 507 *Bacillus subtilis* yddQ ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 2668 *Bacillus subtilis* yrdC ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 3192 *Bacillus subtilis* dhhB ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_3\_2\_1 3644 *Bacillus subtilis* ywoC ISOCHORISMATASE (EC 3\_3\_2\_1)  
 3\_4\_11\_10 7319 *Vibrio cholerae* El Tor N16961ORFA00535 BACTERIAL LEUCYL AMINOPEPTIDASE PRECURSOR (EC 3\_4\_11\_10)  
 3\_4\_11\_10 2220 *Escherichia coli* b2271 BACTERIAL LEUCYL AMINOPEPTIDASE PRECURSOR (EC 3\_4\_11\_10)  
 3\_4\_11\_12 256 *Bordetella pertussis* AMINOPEPTIDASE II (EC 3\_4\_11\_12)  
 3\_4\_11\_12 9074 *Bordetella bronchiseptica* AMINOPEPTIDASE II (EC 3\_4\_11\_12)  
 3\_4\_11\_19 7020 *Pseudomonas aeruginosa* PA1486 D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_11\_19 1569 *Bordetella pertussis* D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_11\_19 1570 *Bordetella pertussis* D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_11\_19 4227 *Bordetella pertussis* D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_11\_19 5512 *Bordetella bronchiseptica* D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_11\_19 9756 *Bordetella bronchiseptica* D-AMINOPEPTIDASE (EC 3\_4\_11\_19)  
 3\_4\_14\_11 298 *Streptococcus pyogenes* pepXP XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)  
 3\_4\_14\_11 845 *Streptococcus pneumoniae* XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)  
 3\_4\_14\_11 210 *Streptococcus mutans* EC-thyA XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)  
 3\_4\_14\_11 605 *Streptococcus mutans* XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)  
 3\_4\_14\_11 875 *Streptococcus equi* XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)  
 3\_4\_15\_5 354 *Salmonella typhimurium* dcp PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 947 *Salmonella typhi* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 4125 *Salmonella paratyphi* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 4126 *Salmonella paratyphi* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 2731 *Salmonella enteritidis* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 2896 *Salmonella dublin* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 535 *Porphyromonas gingivalis* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 696 *Porphyromonas gingivalis* EC-prfC PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 6742 *Klebsiella pneumoniae* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 6743 *Klebsiella pneumoniae* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_15\_5 4973 *Escherichia coli* dcp PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)

3\_4\_15\_5 1136 *Corynebacterium diphtheriae* PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)  
 3\_4\_16\_4 5028 *Yersinia pseudotuberculosis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 6013 *Yersinia pseudotuberculosis* EC-dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 7034 *Yersinia pseudotuberculosis* EC-dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 1331 *Yersinia pestis* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 1911 *Yersinia pestis* EC-dacB PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 4445 *Yersinia pestis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 5215 *Yersinia pestis* EC-dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 4491 *Vibrio cholerae* El Tor N16961 ORF00860 PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 4781 *Vibrio cholerae* El Tor N16961 ORF01253 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 6785 *Vibrio cholerae* El Tor N16961 ORF01229 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 272 *Treponema pallidum* TP0221 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 451 *Treponema pallidum* TP0800 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 376 *Streptococcus pyogenes* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 590 *Streptococcus pyogenes* dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 693 *Streptococcus pyogenes* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 939 *Streptococcus pyogenes* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 246 *Streptococcus pneumoniae* BS-yodJ D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 828 *Streptococcus pneumoniae* BS-dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 333 *Streptococcus mutans* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 83 *Streptococcus equi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 113 *Streptococcus equi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 141 *Staphylococcus aureus* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 30 *Salmonella typhimurium* dacC PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 677 *Salmonella typhimurium* phsF D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2989 *Salmonella typhimurium* yfeW D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3382 *Salmonella typhimurium* dacA PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3590 *Salmonella typhimurium* dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 572 *Salmonella typhi* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 3007 *Salmonella typhi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3329 *Salmonella typhi* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3607 *Salmonella typhi* PENICILLIN-BINDING PROTEIN 6B PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3608 *Salmonella typhi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 4279 *Salmonella typhi* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 1337 *Salmonella paratyphi* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 1338 *Salmonella paratyphi* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 1841 *Salmonella paratyphi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3185 *Salmonella paratyphi* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)

- 3\_4\_16\_4 3484 *Salmonella paratyphi* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 5542 *Salmonella paratyphi* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1339 *Salmonella enteritidis* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1972 *Salmonella enteritidis* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2578 *Salmonella enteritidis* PENICILLIN-BINDING PROTEIN 6B PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2853 *Salmonella enteritidis* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 3440 *Salmonella dublin* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 253 *Rickettsia prowazekii* RP259 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)
- 3\_4\_16\_4 380 *Rickettsia prowazekii* RP389 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2341 *Pseudomonas aeruginosa* dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 7762 *Pseudomonas aeruginosa* PA3047 PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 132 *Porphyromonas gingivalis* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 1375 *Porphyromonas gingivalis* PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 845 *Pasteurella multocida* dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 1201 *Pasteurella multocida* dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 478 *Neisseria gonorrhoeae* EC-dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 672 *Neisseria gonorrhoeae* BS-dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 635 *Mycobacterium tuberculosis* dacB D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1382 *Mycobacterium tuberculosis* Rv1922 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1455 *Mycobacterium tuberculosis* lpqK D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1643 *Mycobacterium tuberculosis* Rv3627c PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 6012 *Mycobacterium tuberculosis* Rv3330 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2278 *Mycobacterium lepraetrj* O69539 PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 3092 *Mycobacterium leprae* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 683 *Mycobacterium bovis* PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 2199 *Mycobacterium bovis* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 3733 *Mycobacterium bovis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)
- 3\_4\_16\_4 3926 *Mycobacterium bovis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)
- 3\_4\_16\_4 4089 *Klebsiella pneumoniae* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)

3\_4\_16\_4 4912 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 4913 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 7017 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 7018 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 7779 *Klebsiella pneumoniae* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 8316 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 8317 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 8318 *Klebsiella pneumoniae* PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 14579 *Haemophilus influenzae* HI0029 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 15453 *Haemophilus influenzae* HI1330 PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 536 *Haemophilus ducreyi* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 537 *Haemophilus ducreyi* EC-dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 1213 *Haemophilus ducreyi* EC-dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 806 *Escherichia coli* dacC PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2370 *Escherichia coli* b2430 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3104 *Escherichia coli* dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 4559 *Escherichia coli* dacA PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 5215 *Escherichia coli* yeeC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 206 *Enterococcus faecium* (DOE) D-ALANYL-D-ALANINE CARBOXYPEPTIDASE PRECURSOR (EC 3\_4\_16\_4)  
 3\_4\_16\_4 836 *Enterococcus faecalis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2411 *Enterococcus faecalis* BS-yodJ D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 578 *Corynebacterium diphtheriae* PENICILLIN-BINDING PROTEIN 5\* PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4)  
 3\_4\_16\_4 730 *Corynebacterium diphtheriae* PENICILLIN-BINDING PROTEIN 4 PRECURSOR (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)  
 3\_4\_16\_4 770 *Clostridium difficile* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 1408 *Clostridium difficile* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2162 *Clostridium difficile* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2643 *Clostridium difficile* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3354 *Clostridium difficile* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3637 *Clostridium difficile* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 1052 *Clostridium acetobutylicum* 24415892\_F1\_1 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2545 *Clostridium acetobutylicum* 5135892\_C1\_23 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2551 *Clostridium acetobutylicum* 34179702\_C2\_26 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 2575 *Clostridium acetobutylicum* 4502338\_F2\_10 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)  
 3\_4\_16\_4 3234 *Clostridium acetobutylicum* 32228131\_F2\_4 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)

- 3\_4\_16\_4 3977 *Clostridium acetobutylicum* 24415892\_F3\_2 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 525 *Chlamydia trachomatis* D/UW-3/Cx dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 75 *Chlamydia pneumoniae* AR39 CP0075 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 618 *Chlamydia pneumoniae* CWL029 dacF D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 152 *Borrelia burgdorferi* BB0605 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 176 *Borrelia burgdorferi* BB0582 D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 3486 *Bordetella pertussis* PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE
- 3\_4\_16\_4 3564 *Bordetella pertussis* EC-dacC D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 5955 *Bordetella bronchiseptica* EC-dacB PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE
- 3\_4\_16\_4 6267 *Bordetella bronchiseptica* EC-dacC PENICILLIN-BINDING PROTEIN 6 PRECURSOR (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE FRACTION C) (EC 3\_4\_16\_4)
- 3\_4\_16\_4 10 *Bacillus subtilis* dacA D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 167 *Bacillus subtilis* ybbE D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 1834 *Bacillus subtilis* pbp PENICILLIN-BINDING PROTEIN 4 (PBP-4) (D-ALANYL-D-ALANINE CARBOXYPEPTIDASE) (EC 3\_4\_16\_4) / D-ALANYL-D-ALANINE-ENDOPEPTIDASE (EC 3\_4\_99\_-)
- 3\_4\_16\_4 1959 *Bacillus subtilis* yodJ D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2315 *Bacillus subtilis* dacB D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_4 2344 *Bacillus subtilis* dacF D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_6 1841 *Saccharomyces cerevisiae* KEX1 CARBOXYPEPTIDASE KEX1 PRECURSOR (EC 3\_4\_16\_6)
- 3\_4\_17\_11 2633 *Pseudomonas aeruginosa* cpg2 CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_11 44 *Pasteurella multocida* CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_11 1107 *Clostridium difficile* CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_11 3394 *Bordetella pertussis* CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_11 6868 *Bordetella bronchiseptica* CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_19 6941 *Yersinia pseudotuberculosis* BS-ypwA THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 1719 *Yersinia pestis* BS-ypwA THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 5237 *Vibrio cholerae* El Tor N16961 ORF01817 THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 177 *Rickettsia prowazekii* RP181 THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 178 *Rickettsia prowazekii* THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 6114 *Klebsiella pneumoniae* THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 1332 *Enterococcus faecium* (DOE) THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 2586 *Enterococcus faecalis* BS-ypwA THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_19 2205 *Bacillus subtilis* ypwA THERMOSTABLE CARBOXYPEPTIDASE 1 (EC 3\_4\_17\_19)
- 3\_4\_17\_4 2244 *Saccharomyces cerevisiae* CPS1 CARBOXYPEPTIDASE S PRECURSOR (EC 3\_4\_17\_4)
- 3\_4\_19\_3 5540 *Yersinia pseudotuberculosis* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 6 *Yersinia pestis* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 535 *Streptococcus pyogenes* sp|Q01328 PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 379 *Streptococcus pneumoniae* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 1655 *Streptococcus pneumoniae* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 2131 *Staphylococcus aureus* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 3429 *Mycobacterium tuberculosis* pcp PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 3509 *Klebsiella pneumoniae* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 806 *Enterococcus faecium* (DOE) PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 1326 *Enterococcus faecalis* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 2747 *Enterococcus faecalis* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 2587 *Clostridium difficile* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_3 266 *Bacillus subtilis* pcp PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)
- 3\_4\_19\_5 3689 *Salmonella typhimurium* iadA ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)
- 3\_4\_19\_5 2530 *Salmonella typhi* ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)
- 3\_4\_19\_5 816 *Salmonella paratyphi* ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)
- 3\_4\_19\_5 817 *Salmonella paratyphi* ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)
- 3\_4\_19\_5 3717 *Salmonella enteritidis* ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)
- 3\_4\_19\_5 6439 *Escherichia coli* iadA ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)

3\_4\_21\_48 2655 *Saccharomyces cerevisiae* PRB1 CEREVISIN PRECURSOR (EC 3\_4\_21\_48)  
 3\_4\_21\_48 2744 *Saccharomyces cerevisiae* YCR045C CEREVISIN (EC 3\_4\_21\_48)  
 3\_4\_21\_50 3933 *Pseudomonas aeruginosa* PA4175 PROTEASE I PRECURSOR (EC 3\_4\_21\_50)  
 3\_4\_21\_50 1346 *Porphyromonas gingivalis* PROTEASE I PRECURSOR (EC 3\_4\_21\_50)  
 3\_4\_21\_61 2851 *Saccharomyces cerevisiae* KEX2 KEXIN PRECURSOR (EC 3\_4\_21\_61)  
 3\_4\_21\_62 1030 *Bacillus subtilis* aprE SUBTILISIN E PRECURSOR (EC 3\_4\_21\_62)  
 3\_4\_21\_72 1680 *Neisseria gonorrhoeae* IMMUNOGLOBULIN A1 PROTEASE (EC 3\_4\_21\_72)  
 3\_4\_21\_72 16173 *Haemophilus influenzae* HI0990 IMMUNOGLOBULIN A1 PROTEASE (EC 3\_4\_21\_72)  
 3\_4\_21\_87 4520 *Escherichia coli* ompT PROTEASE VII PRECURSOR (EC 3\_4\_21\_87)  
 3\_4\_21\_88 6837 *Yersinia pseudotuberculosis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 2332 *Yersinia pestis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 3976 *Vibrio cholerae* El Tor N16961 ORF00139 LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1634 *Staphylococcus aureus* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 568 *Salmonella typhimurium* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 5586 *Salmonella typhi* LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 5357 *Salmonella paratyphi* LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 2199 *Salmonella dublin* LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 6347 *Pseudomonas aeruginosa* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1874 *Pasteurella multocida* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1489 *Mycobacterium tuberculosis* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1314 *Mycobacterium lepraetr*Q49848 LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 808 *Mycobacterium bovis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 8474 *Klebsiella pneumoniae* LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1665 *Haemophilus influenzae* HI0749 LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 177 *Haemophilus ducreyi* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 3929 *Escherichia coli* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 2502 *Enterococcus faecalis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 169 *Corynebacterium diphtheriae* LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 3623 *Clostridium difficile* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 2378 *Clostridium acetobutylicum* 19720265\_F1\_1 LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 2069 *Bordetella pertussis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 5119 *Bordetella bronchiseptica* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_21\_88 1785 *Bacillus subtilis* lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_22\_37 1707 *Porphyromonas gingivalis*trjO33441 ARGININE-SPECIFIC CYSTEINE PROTEINASE RGP-2 (EC 3\_4\_22\_37)  
 3\_4\_23\_23 20437 *Neurospora crassa* MUCOROPEPSIN PRECURSOR (EC 3\_4\_23\_23)  
 3\_4\_23\_25 1788 *Saccharomyces cerevisiae* PEP4 SACCHAROPEPSIN PRECURSOR (EC 3\_4\_23\_25)  
 3\_4\_23\_35 4561 *Saccharomyces cerevisiae* BARI BARRIERPEPSIN PRECURSOR (EC 3\_4\_23\_35)  
 3\_4\_23\_36 8054 *Yersinia pseudotuberculosis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 68 *Yersinia pestis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 4541 *Vibrio cholerae* El Tor N16961 ORF00923 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 742 *Treponema pallidum* TP0978 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 165 *Streptococcus pyogenes* lsp LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 465 *Streptococcus pneumoniae* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1294 *Streptococcus mutans* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 266 *Staphylococcus aureus* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 3431 *Salmonella typhimurium* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1723 *Salmonella typhi* LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 745 *Salmonella paratyphi* LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 3345 *Salmonella dublin* LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 399 *Rickettsia prowazekii* RP408 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 4625 *Pseudomonas aeruginosa* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1807 *Porphyromonas gingivalis* LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 765 *Pasteurella multocida* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 851 *Neisseria gonorrhoeae* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 543 *Mycoplasma pneumoniae* MP543 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 3712 *Mycoplasma genitalium* MG210 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1180 *Mycobacterium tuberculosis* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1591 *Mycobacterium lepraetr*Q9X7E7 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1598 *Mycobacterium bovis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1883 *Klebsiella pneumoniae*trjQ9RF47 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)

- 3\_4\_23\_36 1033 *Helicobacter pylori* HP0074 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 70 *Helicobacter pylori* J99sp|Q9ZM23 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 9403 *Haemophilus influenzae* HI1006 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1287 *Haemophilus ducreyi* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 27 *Escherichia coli* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1032 *Enterococcus faecalis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1695 *Corynebacterium diphtheriae* LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 158 *Clostridium difficile* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 2797 *Clostridium acetobutylicum* 203451\_F2\_9 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 844 *Chlamydia trachomatis* D/UW-3/Cx lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 217 *Chlamydia pneumoniae* AR39 CP0217 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 487 *Chlamydia pneumoniae* CWL029 lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 2773 *Campylobacter jejuni* lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 829 *Borrelia burgdorferi* BB0469 LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 977 *Bordetella pertussis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_23\_36 1546 *Bacillus subtilis* lsp LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_24\_25 7371 *Vibrio cholerae* El Tor N16961ORFA00596 NEUTRAL PROTEASE PRECURSOR (EC 3\_4\_24\_25)  
 3\_4\_24\_26 7085 *Pseudomonas aeruginosa* lasB PSEUDOLYSIN PRECURSOR (EC 3\_4\_24\_26)  
 3\_4\_24\_28 1628 *Enterococcus faecalis* BACILLOLYSIN PRECURSOR (EC 3\_4\_24\_28)  
 3\_4\_24\_28 3569 *Clostridium acetobutylicum* 3173412\_F3\_1 BACILLOLYSIN (EC 3\_4\_24\_28)  
 3\_4\_24\_28 3776 *Clostridium acetobutylicum* 164218\_C2\_3 BACILLOLYSIN (EC 3\_4\_24\_28)  
 3\_4\_24\_28 1110 *Bacillus subtilis* nprB BACILLOLYSIN PRECURSOR (EC 3\_4\_24\_28)  
 3\_4\_24\_28 1471 *Bacillus subtilis* nprE BACILLOLYSIN PRECURSOR (EC 3\_4\_24\_28)  
 3\_4\_24\_3 244 *Streptococcus pyogenes* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 468 *Streptococcus pneumoniae* COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 1298 *Streptococcus pneumoniae* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 720 *Streptococcus mutans* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 661 *Streptococcus equi* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 3301 *Staphylococcus aureus* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 5197 *Salmonella paratyphi* COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 5200 *Salmonella paratyphi* COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 107 *Porphyromonas gingivalis* BS-yrnO COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 2365 *Enterococcus faecium* (DOE) COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 1709 *Enterococcus faecalis* COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 2894 *Enterococcus faecalis* COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_3 2728 *Bacillus subtilis* yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_36 20058 *Neurospora crassa* LEISHMANOLYSIN PRECURSOR (EC 3\_4\_24\_36)  
 3\_4\_24\_37 4431 *Saccharomyces cerevisiae* PRD1 SACCHAROLYSIN (EC 3\_4\_24\_37)  
 3\_4\_24\_55 4959 *Yersinia pseudotuberculosis* BS-ymfH PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3122 *Yersinia pestis* BS-ymfH PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3714 *Yersinia pestis* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 4988 *Salmonella typhimurium* ptr PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3281 *Salmonella typhi* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3680 *Salmonella paratyphi* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3681 *Salmonella paratyphi* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 3682 *Salmonella paratyphi* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 2304 *Salmonella enteritidis* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 2182 *Klebsiella pneumoniae* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 2183 *Klebsiella pneumoniae* PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 1373 *Haemophilus ducreyi* BS-ymfH PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_55 6513 *Escherichia coli* ptr PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_57 4630 *Yersinia pseudotuberculosis* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 6104 *Yersinia pseudotuberculosis* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 495 *Yersinia pestis* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 3508 *Yersinia pestis* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 5784 *Vibrio cholerae* El Tor N16961 ORF02509 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 448 *Ureaplasma urealyticum* UU312 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 555 *Ureaplasma urealyticum* UU411 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)



- 3\_4\_24\_57 554 *Treponema pallidum* TP0680 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 655 *Treponema pallidum* TP0876 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 519 *Streptococcus pyogenes* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 521 *Streptococcus pyogenes* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 561 *Streptococcus pneumoniae* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 563 *Streptococcus pneumoniae* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1362 *Streptococcus mutans* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1364 *Streptococcus mutans* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 382 *Streptococcus equi* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 383 *Streptococcus equi* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1432 *Staphylococcus aureus* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2188 *Staphylococcus aureus* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2009 *Salmonella typhimurium* gcp O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2436 *Salmonella typhimurium* yeaZ O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2056 *Salmonella typhi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 5350 *Salmonella typhi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2139 *Salmonella paratyphi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2140 *Salmonella paratyphi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2142 *Salmonella paratyphi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 4675 *Salmonella paratyphi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 4676 *Salmonella paratyphi* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 3307 *Salmonella enteritidis* PROBABLE O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2408 *Saccharomyces cerevisiae* QRI7 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 3450 *Saccharomyces cerevisiae* YKR038C O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 7984 *Saccharomyces cerevisiae* YGR262C O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 35 *Rickettsia prowazekii* RP037 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 534 *Rickettsia prowazekii* RP551 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 3917 *Pseudomonas aeruginosa* gcp O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 6251 *Pseudomonas aeruginosa* PA3685 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 852 *Porphyromonas gingivalis* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1134 *Porphyromonas gingivalis* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 838 *Pasteurella multocida* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 882 *Pasteurella multocida* gcp O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 474 *Neisseria gonorrhoeae* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1488 *Neisseria gonorrhoeae* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 96 *Mycoplasma pneumoniae* MP095 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 95 *Mycoplasma genitalium* MG046 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1317 *Mycobacterium tuberculosis* Rv3421c O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1319 *Mycobacterium tuberculosis* gcp O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2115 *Mycobacterium leprae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2843 *Mycobacterium leprae* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 2285 *Mycobacterium bovis* EC-ygjD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1586 *Klebsiella pneumoniae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1587 *Klebsiella pneumoniae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_57 1588 *Klebsiella pneumoniae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)



- 3\_4\_24\_57 962 *Helicobacter pylori* HP1584 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1480 *Helicobacter pylori* J99 ydiE PROBABLE O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 8065 *Haemophilus influenzae* HI0388 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 20806 *Haemophilus influenzae* HI0530 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 742 *Haemophilus ducreyi* EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 957 *Haemophilus ducreyi* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 5111 *Escherichia coli* b1807 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 5814 *Escherichia coli* ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 2779 *Enterococcus faecium* (DOE) O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 2784 *Enterococcus faecium* (DOE) O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1349 *Enterococcus faecalis* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1352 *Enterococcus faecalis* EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 289 *Corynebacterium diphtheriae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 431 *Corynebacterium diphtheriae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 432 *Corynebacterium diphtheriae* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 2379 *Clostridium difficile* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 2381 *Clostridium difficile* EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1285 *Clostridium acetobutylicum* 2931513\_F2\_23 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 3744 *Clostridium acetobutylicum* 26361327\_C2\_7 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 187 *Chlamydia trachomatis* D/UW-3/Cx EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 327 *Chlamydia trachomatis* D/UW-3/Cx CT343 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 573 *Chlamydia pneumoniae* AR39 CP0573 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 746 *Chlamydia pneumoniae* AR39 CP0746 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 31 *Chlamydia pneumoniae* CWL029 gcp\_1 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 177 *Chlamydia pneumoniae* CWL029 EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 309 *Campylobacter jejuni* Cj1344c O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1 *Borrelia burgdorferi* BB0769 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 555 *Borrelia burgdorferi* BB0185 O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 1527 *Bordetella pertussis* EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 4501 *Bordetella pertussis* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 7659 *Bordetella bronchiseptica* BS-ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 8334 *Bordetella bronchiseptica* EC-ygD O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 592 *Bacillus subtilis* ydiC O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_57 594 *Bacillus subtilis* ydiE O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)
- 3\_4\_24\_70 7926 *Yersinia pseudotuberculosis* EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 2026 *Yersinia pestis* EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 4071 *Vibrio cholerae* El Tor N16961 ORF00269 OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 649 *Salmonella typhimurium* optA OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 764 *Salmonella paratyphi* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 2014 *Salmonella paratyphi* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 3919 *Salmonella enteritidis* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 4110 *Salmonella dublin* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 2464 *Pseudomonas aeruginosa* prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 1615 *Pasteurella multocida* prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 887 *Neisseria gonorrhoeae* EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 6174 *Klebsiella pneumoniae* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 6175 *Klebsiella pneumoniae* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 6176 *Klebsiella pneumoniae* OLIGOPEPTIDASE A (EC 3\_4\_24\_70)
- 3\_4\_24\_70 4121 *Haemophilus influenzae* HI0214 OLIGOPEPTIDASE A (EC 3\_4\_24\_70)

3\_4\_24\_70 375 Haemophilus ducreyi EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)  
 3\_4\_24\_70 6046 Escherichia coli prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)  
 3\_4\_24\_70 2395 Bordetella pertussis EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)  
 3\_4\_24\_70 6751 Bordetella bronchiseptica EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)  
 3\_4\_24\_75 3190 Staphylococcus aureus LYSOSTAPHIN PRECURSOR (EC 3\_4\_24\_75)  
 3\_5\_1\_1 4155 Yersinia pseudotuberculosis EC-ansB L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 6995 Yersinia pseudotuberculosis EC-ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 72 Yersinia pestis EC-ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2531 Yersinia pestis EC-ansB L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 5790 Vibrio cholerae El Tor N16961 ORF02519 L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 6352 Vibrio cholerae El Tor N16961 ORF03292 L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 788 Streptococcus pyogenes ansB L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 279 Streptococcus pneumoniae EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 280 Streptococcus pneumoniae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1253 Streptococcus mutans EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1573 Streptococcus equi EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1526 Staphylococcus aureus EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2558 Salmonella typhimurium L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2595 Salmonella typhimurium ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 3025 Salmonella typhimurium ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 6472 Salmonella typhimurium ybiK L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1134 Salmonella typhi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2240 Salmonella typhi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2815 Salmonella typhi L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 249 Salmonella paratyphi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 604 Salmonella paratyphi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 605 Salmonella paratyphi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1962 Salmonella paratyphi L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1963 Salmonella paratyphi L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1405 Salmonella enteritidis L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2927 Salmonella enteritidis L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 4232 Salmonella enteritidis L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 4972 Salmonella enteritidis PUTATIVE L-ASPARAGINASE PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 943 Salmonella dublin L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1090 Salmonella dublin PUTATIVE L-ASPARAGINASE PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1293 Salmonella dublin L-ASPARAGINASE I (EC 3\_5\_1\_1)  
 3\_5\_1\_1 3442 Salmonella dublin L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2791 Saccharomyces cerevisiae ASP1 L-ASPARAGINASE I (EC 3\_5\_1\_1)  
 3\_5\_1\_1 81 Pseudomonas aeruginosa ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 823 Porphyromonas gingivalis EC-ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 299 Neisseria gonorrhoeae EC-ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 3679 Mycobacterium tuberculosis ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1592 Mycobacterium leprae EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1597 Mycobacterium bovis EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2804 Klebsiella pneumoniae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2805 Klebsiella pneumoniae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2806 Klebsiella pneumoniae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 7348 Klebsiella pneumoniae L-ASPARAGINASE PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 7349 Klebsiella pneumoniae L-ASPARAGINASE PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_1 8179 Klebsiella pneumoniae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 151 Helicobacter pylori HP0723 L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 661 Helicobacter pylori J99sp|Q9ZLB9 L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 8911 Haemophilus influenzae HI0745 L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 820 Haemophilus ducreyi EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 795 Escherichia coli ybiK L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1724 Escherichia coli ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 5750 Escherichia coli ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2596 Enterococcus faecalis EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 140 Corynebacterium diphtheriae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1698 Corynebacterium diphtheriae L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 563 Clostridium difficile L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2965 Clostridium acetobutylicum 6635\_C3\_20 L-ASPARAGINASE (EC 3\_5\_1\_1)

3\_5\_1\_1 1148 *Campylobacter jejuni* ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1207 *Bordetella pertussis* L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 1208 *Bordetella pertussis* EC-ansB L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 4250 *Bordetella pertussis* EC-ybIK L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 8415 *Bordetella bronchiseptica* EC-ybIK L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 270 *Bacillus subtilis* yccC L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_1 2354 *Bacillus subtilis* ansA L-ASPARAGINASE (EC 3\_5\_1\_1)  
 3\_5\_1\_10 4326 *Yersinia pseudotuberculosis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 149 *Yersinia pestis* EC-purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 3791 *Yersinia pestis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 5787 *Vibrio cholerae* El Tor N16961 ORF02513 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 3439 *Salmonella typhimurium* tgs FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 5199 *Salmonella typhimurium* yceP FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 356 *Salmonella typhi* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 4138 *Salmonella typhi* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 501 *Salmonella paratyphi* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1526 *Salmonella paratyphi* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 824 *Salmonella enteritidis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1285 *Salmonella enteritidis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1059 *Salmonella dublin* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 2512 *Salmonella dublin* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 5003 *Pseudomonas aeruginosa* purU2 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 8224 *Pseudomonas aeruginosa* purU1 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1694 *Pasteurella multocida* purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 813 *Mycobacterium tuberculosis* purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 3528 *Mycobacterium bovis* EC-purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1896 *Klebsiella pneumoniae* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 7137 *Klebsiella pneumoniae* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 819 *Helicobacter pylori* HP1434 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1157 *Helicobacter pylori* J99sp|Q9ZJY0 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1315 *Helicobacter pylori* J99tr|Q9ZJ12 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 3271 *Haemophilus influenzae* HI1588 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 4753 *Escherichia coli* b1060 FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 4825 *Escherichia coli* purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 2 *Campylobacter jejuni* Cj0630c FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1323 *Campylobacter jejuni* purU FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 3297 *Bordetella pertussis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 8257 *Bordetella bronchiseptica* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_10 1312 *Bacillus subtilis* ykkE FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_11 2811 *Staphylococcus aureus* BS-yxeI PENICILLIN ACYLASE (EC 3\_5\_1\_11)  
 3\_5\_1\_11 1770 *Pseudomonas aeruginosa* PA0305 PENICILLIN ACYLASE II PRECURSOR (EC 3\_5\_1\_11)  
 3\_5\_1\_11 6244 *Pseudomonas aeruginosa* PA1893 PENICILLIN ACYLASE (EC 3\_5\_1\_11)  
 3\_5\_1\_16 4279 *Yersinia pseudotuberculosis* EC-argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 1386 *Yersinia pestis* EC-argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 6394 *Vibrio cholerae* El Tor N16961 ORF03344 ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 5227 *Salmonella typhimurium* argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 1720 *Salmonella typhi* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 2419 *Salmonella paratyphi* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 2420 *Salmonella paratyphi* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 2421 *Salmonella paratyphi* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)

3\_5\_1\_16 3603 *Salmonella enteritidis* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 1736 *Salmonella dublin* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 3491 *Pseudomonas aeruginosa* PA5390 ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 7615 *Pseudomonas aeruginosa* argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 551 *Pasteurella multocida* argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 900 *Klebsiella pneumoniae* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 901 *Klebsiella pneumoniae* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 7476 *Klebsiella pneumoniae* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 191 *Haemophilus ducreyi* EC-argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 2796 *Escherichia coli* b2872 ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 6268 *Escherichia coli* argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 688 *Enterococcus faecalis* BS-ylmB ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 296 *Clostridium difficile* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 447 *Clostridium difficile* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 60 *Bordetella pertussis* gj39742 ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 2779 *Bordetella pertussis* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 5881 *Bordetella bronchiseptica* ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_16 1968 *Bacillus subtilis* argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_18 7425 *Yersinia pseudotuberculosis* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1511 *Yersinia pestis* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 5939 *Vibrio cholerae* El Tor N16961 ORF02722 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1416 *Streptococcus pneumoniae* BS-ytjP SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 965 *Streptococcus mutans* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1925 *Staphylococcus aureus* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 3493 *Salmonella typhimurium* msgB SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 36 *Salmonella typhi* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 4025 *Salmonella paratyphi* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 4026 *Salmonella paratyphi* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 4027 *Salmonella paratyphi* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1028 *Salmonella dublin* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 844 *Rickettsia prowazekii* RP874 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 3960 *Pseudomonas aeruginosa* dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1781 *Pasteurella multocida* dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 249 *Neisseria gonorrhoeae* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 5088 *Mycobacterium tuberculosis* dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1113 *Mycobacterium leprae* EC-argE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 2119 *Mycobacterium bovis* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 6503 *Klebsiella pneumoniae* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1161 *Helicobacter pylori* HP0212 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 202 *Helicobacter pylori* J99tr[Q9ZMM0 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 14433 *Haemophilus influenzae* HI0102 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1491 *Haemophilus ducreyi* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 2412 *Escherichia coli* dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1211 *Enterococcus faecium* (DOE) SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 2335 *Enterococcus faecalis* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)

3\_5\_1\_18 2590 *Enterococcus faecalis* BS-ytp SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1422 *Corynebacterium diphtheriae* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 2127 *Clostridium difficile* SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 546 *Clostridium acetobutylicum* 975937\_C2\_76 SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 1711 *Campylobacter jejuni* dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 822 *Bordetella pertussis* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 5336 *Bordetella bronchiseptica* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_18 2992 *Bacillus subtilis* ytp SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_19 5821 *Yersinia pseudotuberculosis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 73 *Yersinia pestis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 7218 *Vibrio cholerae* El Tor N16961ORFA00407 PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 539 *Treponema pallidum* TP0696 NICOTINAMIDASE (EC 3\_5\_1\_19)  
 3\_5\_1\_19 2596 *Salmonella typhimurium* nam PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 1133 *Salmonella typhi* PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 607 *Salmonella paratyphi* PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 8451 *Saccharomyces cerevisiae* PNC1 PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 7913 *Pseudomonas aeruginosa* PA4918 PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 1093 *Porphyromonas gingivalis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 1804 *Neisseria gonorrhoeae* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 3702 *Mycobacterium tuberculosis* pncA PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 3436 *Mycobacterium bovis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 2803 *Klebsiella pneumoniae* PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 1725 *Escherichia coli* ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 1057 *Borrelia burgdorferi* BBE22 PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 3853 *Bordetella pertussis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_19 8728 *Bordetella bronchiseptica* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_23 933 *Pseudomonas aeruginosa* PA0845 ALKALINE CERAMIDASE (EC 3\_5\_1\_23)  
 3\_5\_1\_23 4779 *Mycobacterium tuberculosis* Rv0669c ALKALINE CERAMIDASE (EC 3\_5\_1\_23)  
 3\_5\_1\_23 3244 *Mycobacterium bovis* ALKALINE CERAMIDASE (EC 3\_5\_1\_23)  
 3\_5\_1\_24 7383 *Vibrio cholerae* El Tor N16961ORFA00610 CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 6541 *Salmonella typhimurium* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 168 *Salmonella typhi* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 1953 *Salmonella enteritidis* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 3991 *Salmonella dublin* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 3614 *Enterococcus faecium* (DOE) CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 852 *Enterococcus faecalis* BS-yxe1 CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 2439 *Enterococcus faecalis* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 1478 *Bordetella pertussis* CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 2223 *Bordetella pertussis* BS-yxe1 CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)

3\_5\_1\_24 7950 *Bordetella bronchiseptica* BS-yxel CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_24 3947 *Bacillus subtilis* yxI CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_25 5703 *Yersinia pseudotuberculosis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 7386 *Yersinia pseudotuberculosis* EC-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 3507 *Yersinia pestis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 4190 *Yersinia pestis* EC-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 80 *Vibrio cholerae* El Tor N16961 ORF01316 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 5580 *Vibrio cholerae* El Tor N16961 ORF02264 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 71 *Streptococcus pyogenes* nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1604 *Staphylococcus aureus* EC-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 6364 *Salmonella typhimurium*-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 4403 *Salmonella typhi* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2395 *Salmonella paratyphi* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2396 *Salmonella paratyphi* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2397 *Salmonella paratyphi* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2398 *Salmonella paratyphi* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 276 *Salmonella enteritidis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1597 *Salmonella dublin* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1641 *Pseudomonas aeruginosa* PA3758 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1695 *Pasteurella multocida* nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 6014 *Mycobacterium tuberculosis* nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2197 *Mycobacterium bovis* EC-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 3103 *Klebsiella pneumoniae* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 21597 *Haemophilus influenzae* HI0140 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 410 *Haemophilus ducreyi* EC-nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 4587 *Escherichia coli* nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 331 *Enterococcus faecium* (DOE) N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1926 *Enterococcus faecalis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 2202 *Enterococcus faecalis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1841 *Corynebacterium diphtheriae* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 950 *Clostridium difficile* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 1237 *Clostridium difficile* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 504 *Clostridium acetobutylicum* 34274001\_F1\_6 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)

3\_5\_1\_25 587 *Borrelia burgdorferi* BB0151 N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_25 3496 *Bacillus subtilis* nagA N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_32 20244 *Neurospora crassa* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 759 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 760 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 3135 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 3136 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 3137 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 3138 *Klebsiella pneumoniae* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 2867 *Campylobacter jejuni* hipO HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 657 *Bordetella pertussis* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_32 7214 *Bordetella bronchiseptica* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_33 1494 *Streptococcus pneumoniae* peptidoglycan N-acetylglucosamine deacetylase (EC 3\_5\_1\_33)  
 3\_5\_1\_38 725 *Pseudomonas aeruginosa* ansB GLUTAMINASE-ASPARAGINASE (EC 3\_5\_1\_38)  
 3\_5\_1\_4 6585 *Saccharomyces cerevisiae* AMD2 AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_4 6120 *Pseudomonas aeruginosa* amiE ALIPHATIC AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_4 3373 *Mycobacterium leprae* PUTATIVE AMIDASE CY50\_19C (EC 3\_5\_1\_4)  
 3\_5\_1\_4 3374 *Mycobacterium leprae* PUTATIVE AMIDASE CY50\_19C (EC 3\_5\_1\_4)  
 3\_5\_1\_4 3411 *Mycobacterium leprae* PUTATIVE AMIDASE CY50\_19C (EC 3\_5\_1\_4)  
 3\_5\_1\_4 1501 *Mycobacterium bovis* PUTATIVE AMIDASE CY50\_19C (EC 3\_5\_1\_4)  
 3\_5\_1\_4 1502 *Mycobacterium bovis* PUTATIVE AMIDASE CY50\_19C (EC 3\_5\_1\_4)  
 3\_5\_1\_4 634 *Helicobacter pylori* HP1238 ALIPHATIC AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_4 1241 *Helicobacter pylori* HP0294 ALIPHATIC AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_4 283 *Helicobacter pylori* J99tr|Q9ZME1 ALIPHATIC AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_4 1149 *Helicobacter pylori* J99tr|Q9ZJY8 ALIPHATIC AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_41 2609 *Saccharomyces cerevisiae* CDA1 CHITIN DEACETYLASE 2 (EC 3\_5\_1\_41)  
 3\_5\_1\_41 4398 *Saccharomyces cerevisiae* CDA2 CHITIN DEACETYLASE PRECURSOR (EC 3\_5\_1\_41)  
 3\_5\_1\_46 423 *Pseudomonas aeruginosa* PA5542 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 8553 *Pseudomonas aeruginosa* PA4347 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 8734 *Pseudomonas aeruginosa* PA2228 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 1251 *Mycobacterium tuberculosis* Rv1723 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 135 *Mycobacterium bovis* 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 3209 *Klebsiella pneumoniae* 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 2333 *Enterococcus faecium* (DOE) 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_46 758 *Clostridium difficile* 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_49 3660 *Bordetella pertussis* FORMAMIDASE (EC 3\_5\_1\_49)  
 3\_5\_1\_49 5256 *Bordetella bronchiseptica* FORMAMIDASE (EC 3\_5\_1\_49)  
 3\_5\_1\_5 6613 *Yersinia pseudotuberculosis* UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3419 *Yersinia pestis* UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3570 *Yersinia pestis* UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3743 *Yersinia pestis*tr|Q9ZFS0 UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 80 *Ureaplasma urealyticum* UU432 UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 82 *Ureaplasma urealyticum* UU433 UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 108 *Ureaplasma urealyticum* UU434 UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 1234 *Staphylococcus aureus* BS-ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 2422 *Staphylococcus aureus* BS-ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3201 *Staphylococcus aureus* BS-ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4411 *Pseudomonas aeruginosa* ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4412 *Pseudomonas aeruginosa* ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 7688 *Pseudomonas aeruginosa* ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 851 *Mycobacterium tuberculosis* ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 852 *Mycobacterium tuberculosis* ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 853 *Mycobacterium tuberculosis* ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3853 *Mycobacterium bovis* BS-ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3854 *Mycobacterium bovis* BS-ureB UREASE (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3856 *Mycobacterium bovis* BS-ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 399 *Klebsiella pneumoniae* UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)

3\_5\_1\_5 4843 *Klebsiella pneumoniae* UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4844 *Klebsiella pneumoniae* UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 1031 *Helicobacter pylori* HP0072 UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 1032 *Helicobacter pylori* HP0073 UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 68 *Helicobacter pylori* J99 ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 69 *Helicobacter pylori* J99sp/Q9ZMZ4 UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 13527 *Haemophilus influenzae* HI0541 UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 13528 *Haemophilus influenzae* HI0540 UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 20788 *Haemophilus influenzae* HI0539 UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4064 *Bordetella pertussis* BS-ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4065 *Bordetella pertussis* BS-ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 4067 *Bordetella pertussis* BS-ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 21 *Bordetella bronchiseptica* BS-ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 23 *Bordetella bronchiseptica* BS-ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 24 *Bordetella bronchiseptica* BS-ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3659 *Bacillus subtilis* ureC UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3660 *Bacillus subtilis* ureB UREASE BETA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_5 3661 *Bacillus subtilis* ureA UREASE GAMMA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_54 4285 *Yersinia pseudotuberculosis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2282 *Yersinia pestis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 7283 *Vibrio cholerae* El Tor N16961ORFA00493 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 7284 *Vibrio cholerae* El Tor N16961ORFA00494 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 922 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 923 *Staphylococcus aureus* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 1360 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 1361 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 5051 *Salmonella typhimurium* ybgK UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 5052 *Salmonella typhimurium* ybgJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3339 *Salmonella typhi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 4842 *Salmonella typhi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3245 *Salmonella paratyphi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3246 *Salmonella paratyphi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3905 *Salmonella dublin* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 6608 *Saccharomyces cerevisiae* DUR1,2 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2353 *Pseudomonas aeruginosa* PA4510 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2354 *Pseudomonas aeruginosa* PA4509 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 4869 *Pseudomonas aeruginosa* PA2110 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 5257 *Pseudomonas aeruginosa* PA0495 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54) / BIOTIN CARBOXYLASE (EC 6\_3\_4\_14)  
 3\_5\_1\_54 5258 *Pseudomonas aeruginosa* PA0496 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 8451 *Pseudomonas aeruginosa* PA2111 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)



3\_5\_1\_54 2743 *Mycobacterium tuberculosis* Rv0263c UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2744 *Mycobacterium tuberculosis* Rv0264c UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 421 *Mycobacterium leprae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 422 *Mycobacterium leprae* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3460 *Mycobacterium bovis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 3461 *Mycobacterium bovis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 1735 *Klebsiella pneumoniae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 1737 *Klebsiella pneumoniae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 14660 *Haemophilus influenzae* HI1730 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 18274 *Haemophilus influenzae* HI1731 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 685 *Escherichia coli* b0711 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 686 *Escherichia coli* b0712 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 271 *Clostridium difficile* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 272 *Clostridium difficile* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2019 *Campylobacter jejuni* Cj1542 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 2021 *Campylobacter jejuni* Cj1543 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 4415 *Bordetella pertussis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_54 7189 *Bordetella bronchiseptica* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_59 2726 *Staphylococcus aureus* BS-yaal N-CARBAMOYLSARCOSINE AMIDASE (EC 3\_5\_1\_59)  
 3\_5\_1\_68 7027 *Yersinia pseudotuberculosis* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 2539 *Yersinia pestis* Q9ZC73 N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 2279 *Pseudomonas aeruginosa* hutG N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 3150 *Bordetella pertussis* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 3868 *Bordetella pertussis* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 5743 *Bordetella bronchiseptica* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_68 7638 *Bordetella bronchiseptica* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_78 6658 *Salmonella typhimurium* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 3398 *Salmonella typhi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 5497 *Salmonella paratyphi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 5498 *Salmonella paratyphi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 3827 *Salmonella enteritidis* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 4494 *Salmonella dublin* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) (GLUTATHIONE:SPERMIDINE LIGASE [ADP-FORMING]) (GSP SYNTHETASE);

GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78) (GLUTATHIONYLSPERMIDINE AMIDOHYDROLASE [SPERMIDINE- FORMING]) (GSP AMIDASE) ]  
 3\_5\_1\_78 4641 *Klebsiella pneumoniae* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_78 5772 *Escherichia coli* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_80 6605 *Escherichia coli* agaA N-acetylgalactosamine-6-phosphate deacetylase (EC 3\_5\_1\_80)  
 3\_5\_1\_81 6947 *Klebsiella pneumoniae* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_81 6948 *Klebsiella pneumoniae* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_81 9294 *Klebsiella pneumoniae* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_81 739 *Clostridium difficile* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_81 1550 *Clostridium difficile* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_82 637 *Mycobacterium tuberculosis* Rv2913c N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_1\_82 644 *Mycobacterium bovis* N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_1\_82 1495 *Bordetella pertussis* N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_1\_82 4613 *Bordetella pertussis* N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_1\_82 4787 *Bordetella pertussis* N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_1\_82 8553 *Bordetella bronchiseptica* N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_2\_10 360 *Mycobacterium tuberculosis* Rv0695 creatininase (EC 3\_5\_2\_10)  
 3\_5\_2\_10 3960 *Mycobacterium bovis* creatininase (EC 3\_5\_2\_10)  
 3\_5\_2\_10 7968 *Klebsiella pneumoniae* creatininase (EC 3\_5\_2\_10)  
 3\_5\_2\_12 903 *Streptococcus pyogenes* amC 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_12 1309 *Streptococcus mutans* 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_12 953 *Streptococcus equi* 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_12 1217 *Enterococcus faecium* (DOE) 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_12 326 *Enterococcus faecalis* 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_12 9625 *Bordetella bronchiseptica* 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)  
 3\_5\_2\_14 4214 *Saccharomyces cerevisiae* YKL215C N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)  
 3\_5\_2\_14 5160 *Mycobacterium tuberculosis* Rv0266c N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)  
 3\_5\_2\_14 3627 *Mycobacterium bovis* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)  
 3\_5\_2\_14 3794 *Bordetella pertussis* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)  
 3\_5\_2\_14 7418 *Bordetella bronchiseptica* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)  
 3\_5\_2\_14 8171 *Bordetella bronchiseptica* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14)  
 3\_5\_2\_14 8443 *Bordetella bronchiseptica* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14)  
 3\_5\_2\_14 8462 *Bordetella bronchiseptica* N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14)  
 3\_5\_2\_5 5495 *Salmonella typhimurium* ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 6608 *Salmonella typhimurium* allA ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 3001 *Salmonella typhi* ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 5615 *Salmonella paratyphi* ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 5616 *Salmonella paratyphi* ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 934 *Salmonella enteritidis* PUTATIVE ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 2653 *Salmonella dublin* ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 3910 *Saccharomyces cerevisiae* DAL1 ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 1851 *Pseudomonas aeruginosa* PA5541 ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 495 *Escherichia coli* b0512 ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 312 *Enterococcus faecalis* BS-yunH ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_5 3236 *Bacillus subtilis* yunH ALLANTOINASE (EC 3\_5\_2\_5)  
 3\_5\_2\_6 2373 *Yersinia pestis* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)  
 3\_5\_2\_6 7549 *Vibrio cholerae* El Tor N16961ORFA00821 BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)  
 3\_5\_2\_6 336 *Streptococcus equi* BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)

- 3\_5\_2\_6 6023 *Salmonella typhimurium* METALLO-BETA-LACTAMASE LI PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2770 *Salmonella typhi* BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 3634 *Salmonella paratyphi* METALLO-BETA-LACTAMASE LI PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4953 *Salmonella enteritidis* METALLO-BETA-LACTAMASE LI PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2462 *Salmonella dublin* METALLO-BETA-LACTAMASE LI PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 1334 *Pseudomonas aeruginosa* ampC BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4527 *Pseudomonas aeruginosa* PA0057 BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4808 *Pseudomonas aeruginosa* PA5514 BETA-LACTAMASE OXA-2 (EC 3\_5\_2\_6)
- 3\_5\_2\_6 1222 *Mycobacterium tuberculosis* blaC PROBABLE BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2792 *Mycobacterium tuberculosis* lpqF BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 3203 *Mycobacterium leprae* BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 3213 *Mycobacterium leprae* BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2155 *Mycobacterium bovis* BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2415 *Mycobacterium bovis* PROBABLE BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 111 *Klebsiella pneumoniae* trjO06025 BETA-LACTAMASE SHV-5A (EC 3\_5\_2\_6)
- 3\_5\_2\_6 1202 *Klebsiella pneumoniae* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 6994 *Klebsiella pneumoniae* BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 6996 *Klebsiella pneumoniae* BETA-LACTAMASE SHV-1 (EC 3\_5\_2\_6)
- 3\_5\_2\_6 8897 *Klebsiella pneumoniae* BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 9205 *Klebsiella pneumoniae* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 6359 *Escherichia coli* ampC BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 505 *Clostridium difficile* METALLO-BETA-LACTAMASE LI PRECURSOR (BETA-LACTAMASE, TYPE II) (EC 3\_5\_2\_6)
- 3\_5\_2\_6 3406 *Clostridium difficile* BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 3411 *Clostridium difficile* BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 502 *Clostridium acetobutylicum* 35445890\_F1\_5 BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2345 *Clostridium acetobutylicum* 24230267\_C3\_31 BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4204 *Clostridium acetobutylicum* METALLO-BETA-LACTAMASE LI PRECURSOR (BETA-LACTAMASE, TYPE II) (EC 3\_5\_2\_6)
- 3\_5\_2\_6 2766 *Campylobacter jejuni* Cj0299 BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4038 *Bordetella pertussis* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 4949 *Bordetella bronchiseptica* BETA-LACTAMASE PRECURSOR (EC 3\_5\_2\_6)
- 3\_5\_2\_6 7024 *Bordetella bronchiseptica* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_6 210 *Bacillus subtilis* ybxI BETA-LACTAMASE (EC 3\_5\_2\_6)
- 3\_5\_2\_7 7028 *Yersinia pseudotuberculosis* BS-hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 2538 *Yersinia pestis* sp|Q9ZC74 IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 5031 *Vibrio cholerae* El Tor N16961 ORF01565 IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 1122 *Streptococcus pyogenes* hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 2088 *Staphylococcus aureus* BS-hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 2659 *Salmonella typhimurium* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 4068 *Salmonella typhi* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 565 *Salmonella paratyphi* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 3368 *Salmonella dublin* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 2278 *Pseudomonas aeruginosa* hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 4 *Porphyromonas gingivalis* BS-hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 4375 *Klebsiella pneumoniae* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 4376 *Klebsiella pneumoniae* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 1214 *Helicobacter pylori* HP0267 IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 257 *Helicobacter pylori* J99tr|Q9ZMG8 IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 1613 *Enterococcus faecalis* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 2262 *Bordetella pertussis* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 9262 *Bordetella bronchiseptica* IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_2\_7 3930 *Bacillus subtilis* hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_3\_11 7320 *Vibrio cholerae* El Tor N16961 ORFA00536 AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 5675 *Salmonella typhimurium* AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 6858 *Salmonella typhimurium* speB AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 561 *Salmonella typhi* AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 3614 *Salmonella paratyphi* AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 6450 *Salmonella paratyphi* AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 1986 *Salmonella enteritidis* AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_11 4703 *Salmonella dublin* AGMATINASE (EC 3\_5\_3\_11)

3\_5\_3\_11 7030 *Pseudomonas aeruginosa* speB2 AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 8006 *Pseudomonas aeruginosa* speB1 AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 154 *Pasteurella multocida* speE AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 1215 *Neisseria gonorrhoeae* EC-speB AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 1636 *Klebsiella pneumoniae* AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 1637 *Klebsiella pneumoniae* AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 3339 *Klebsiella pneumoniae* AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 5744 *Escherichia coli* speB AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 640 *Clostridium difficile* EC-speB AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 3379 *Bordetella pertussis* PUTATIVE AGMATINASE PRECURSOR (EC 3\_5\_3\_11)  
 3\_5\_3\_11 6073 *Bordetella bronchiseptica* AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_11 7873 *Bordetella bronchiseptica* PUTATIVE AGMATINASE PRECURSOR (EC 3\_5\_3\_11)  
 3\_5\_3\_11 3743 *Bacillus subtilis* ywhG AGMATINASE (EC 3\_5\_3\_11)  
 3\_5\_3\_19 6600 *Salmonella typhimurium* glxA2 UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 4814 *Salmonella typhi* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 5601 *Salmonella paratyphi* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 3523 *Salmonella enteritidis* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 1664 *Salmonella dublin* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 7021 *Saccharomyces cerevisiae* DAL3 UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 2790 *Pseudomonas aeruginosa* PA1514 UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 488 *Escherichia coli* b0505 UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 2125 *Bordetella pertussis* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_19 8647 *Bordetella bronchiseptica* UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)  
 3\_5\_3\_4 2548 *Saccharomyces cerevisiae* DAL2 ALLANTOICASE (EC 3\_5\_3\_4)  
 3\_5\_3\_4 2791 *Pseudomonas aeruginosa* alc ALLANTOICASE (EC 3\_5\_3\_4)  
 3\_5\_3\_4 76 *Neurospora crassa* alc ALLANTOICASE (EC 3\_5\_3\_4)  
 3\_5\_3\_6 4290 *Vibrio cholerae* El Tor N16961 ORF00596 ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 1429 *Streptococcus pyogenes* sagP (arcA) ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 715 *Streptococcus pneumoniae* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2842 *Staphylococcus aureus* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2468 *Salmonella typhimurium* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2557 *Salmonella typhi* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 3379 *Salmonella paratyphi* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 3380 *Salmonella paratyphi* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 1795 *Salmonella enteritidis* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2035 *Salmonella dublin* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2726 *Pseudomonas aeruginosa* arcA ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 283 *Mycoplasma pneumoniae* spP75218 ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 532 *Mycoplasma pneumoniae* arcA ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 533 *Mycoplasma pneumoniae* arcA ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 4486 *Mycobacterium tuberculosis* arcA ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 3624 *Mycobacterium bovis* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2778 *Enterococcus faecium* (DOE) ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 2249 *Enterococcus faecalis* ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 743 *Borrelia burgdorferi* BB0841 ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_6 1303 *Bacillus subtilis* ykgA ARGININE DEIMINASE (EC 3\_5\_3\_6)  
 3\_5\_3\_8 5030 *Vibrio cholerae* El Tor N16961 ORF01564 FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 1114 *Streptococcus pyogenes* hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 2666 *Staphylococcus aureus* BS-hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 1602 *Salmonella typhimurium* hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 3595 *Salmonella typhi* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 1880 *Salmonella paratyphi* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 638 *Salmonella enteritidis* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 3367 *Salmonella dublin* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 5988 *Pseudomonas aeruginosa* PA3175 FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 4377 *Klebsiella pneumoniae* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 4378 *Klebsiella pneumoniae* FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 2052 *Bordetella pertussis* BS-hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 7112 *Bordetella bronchiseptica* BS-hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_8 3931 *Bacillus subtilis* hutG FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)  
 3\_5\_3\_9 6912 *Yersinia pseudotuberculosis* BS-yurH allantoate deiminase (EC 3\_5\_3\_9)  
 3\_5\_3\_9 5625 *Salmonella paratyphi* allantoate deiminase (EC 3\_5\_3\_9)

3\_5\_3\_9 4237 *Klebsiella pneumoniae* allantoate deiminase (EC 3\_5\_3\_9)  
 3\_5\_4\_1 7885 *Yersinia pseudotuberculosis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1408 *Yersinia pestis* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 4037 *Yersinia pestis* EC-codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 4710 *Vibrio cholerae* El Tor N16961 ORF01148 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 864 *Streptococcus pyogenes* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1123 *Streptococcus pneumoniae* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1482 *Streptococcus mutans* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 775 *Streptococcus equi* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 912 *Staphylococcus aureus* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 6106 *Salmonella typhimurium* codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 6910 *Salmonella typhimurium* yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 559 *Salmonella typhi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1022 *Salmonella typhi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 771 *Salmonella paratyphi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 772 *Salmonella paratyphi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2841 *Salmonella paratyphi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2843 *Salmonella paratyphi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 712 *Salmonella enteritidis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 4092 *Salmonella enteritidis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 3739 *Salmonella dublin* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 4486 *Saccharomyces cerevisiae* TAD3 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 7002 *Saccharomyces cerevisiae* FCY1 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 803 *Rickettsia prowazekii* RP831 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1856 *Pseudomonas aeruginosa* PA3767 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 5963 *Pseudomonas aeruginosa* codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1109 *Porphyromonas gingivalis* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 317 *Pasteurella multocida* EC-codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 942 *Pasteurella multocida* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1156 *Pasteurella multocida* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 541 *Neisseria gonorrhoeae* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 3832 *Mycobacterium tuberculosis* Rv3752c CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 4095 *Mycobacterium bovis* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 3177 *Klebsiella pneumoniae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 6338 *Klebsiella pneumoniae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 6339 *Klebsiella pneumoniae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 7570 *Klebsiella pneumoniae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 7965 *Klebsiella pneumoniae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1927 *Haemophilus influenzae* HI0906 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 9072 *Haemophilus influenzae* HI0842 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 64 *Haemophilus ducreyi* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 219 *Haemophilus ducreyi* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 308 *Escherichia coli* b0324 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 321 *Escherichia coli* codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 5547 *Escherichia coli* yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 3709 *Enterococcus faecium* (DOE) CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1554 *Enterococcus faecalis* EC-codA CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1750 *Enterococcus faecalis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2319 *Enterococcus faecalis* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2362 *Enterococcus faecalis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2363 *Enterococcus faecalis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2068 *Corynebacterium diphtheriae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2069 *Corynebacterium diphtheriae* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 367 *Clostridium difficile* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 1911 *Clostridium acetobutylicum* 4886265\_F3\_9 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 807 *Chlamydia trachomatis* D/UW-3/Cx EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 852 *Chlamydia pneumoniae* AR39 CP0852 CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 926 *Chlamydia pneumoniae* CWL029 EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 2742 *Bordetella pertussis* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 7490 *Bordetella bronchiseptica* EC-yfhC CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_1 18 *Bacillus subtilis* yaaJ CYTOSINE DEAMINASE (EC 3\_5\_4\_1)  
 3\_5\_4\_13 6177 *Yersinia pseudotuberculosis* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)

3\_5\_4\_13 1413 *Yersinia pestis* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 3318 *Salmonella typhimurium* paxA DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 3401 *Salmonella typhi* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 794 *Salmonella paratyphi* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 3155 *Salmonella dublin* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 68 *Rickettsia prowazekii* RP069 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1120 *Pseudomonas aeruginosa* PA3480 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1744 *Pasteurella multocida* dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1176 *Neisseria gonorrhoeae* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 3427 *Mycobacterium tuberculosis* dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 564 *Mycobacterium leprae* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 3670 *Mycobacterium bovis* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 8499 *Klebsiella pneumoniae* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1309 *Helicobacter pylori* HP0372 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1000 *Helicobacter pylori* J99splQ9ZKD0 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 7529 *Haemophilus influenzae* HI0133 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 571 *Haemophilus ducreyi* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 5259 *Escherichia coli* dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 1880 *Corynebacterium diphtheriae* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 762 *Clostridium acetobutylicum* 24877217\_C1\_35 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 36 *Chlamydia trachomatis* D/UW-3/Cx dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 363 *Chlamydia pneumoniae* AR39 CP0363 DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 354 *Chlamydia pneumoniae* CWL029 dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 2670 *Campylobacter jejuni* dcd DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 334 *Bordetella pertussis* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_13 6093 *Bordetella bronchiseptica* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)  
 3\_5\_4\_19 6635 *Yersinia pseudotuberculosis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 2944 *Yersinia pestis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 401 *Streptococcus mutans* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 1464 *Staphylococcus aureus* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 501 *Salmonella typhimurium* hisIE PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 1641 *Salmonella typhi* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 6191 *Salmonella paratyphi* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 2826 *Salmonella enteritidis* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 2328 *Salmonella dublin* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 6837 *Saccharomyces cerevisiae* HIS4 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 3\_5\_4\_19 1626 *Pseudomonas aeruginosa* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 1897 *Pasteurella multocida* hisIE PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 14 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)

3\_5\_4\_19 15 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE  
 (EC 1\_1\_1\_23)  
 3\_5\_4\_19 172 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE  
 (EC 1\_1\_1\_23)  
 3\_5\_4\_19 936 *Neisseria gonorrhoeae* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 3166 *Mycobacterium tuberculosis* hisI2 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19)  
 3\_5\_4\_19 2922 *Mycobacterium leprae*tr|Q9X7C3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19)  
 3\_5\_4\_19 2502 *Mycobacterium bovis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 473 *Klebsiella pneumoniae* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 8280 *Haemophilus influenzae* HI0475 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 6489 *Escherichia coli* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 1804 *Corynebacterium diphtheriae* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 1149 *Clostridium difficile* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 2124 *Clostridium acetobutylicum* 7087542\_C2\_36 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE  
 (EC 3\_5\_4\_19)  
 3\_5\_4\_19 905 *Campylobacter jejuni* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_19 767 *Bordetella pertussis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19)  
 3\_5\_4\_19 7970 *Bordetella bronchiseptica* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19)  
 3\_5\_4\_19 3481 *Bacillus subtilis* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_5\_4\_2 799 *Klebsiella pneumoniae* ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 800 *Klebsiella pneumoniae* ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 1613 *Klebsiella pneumoniae* ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 3584 *Escherichia coli* yicP ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 2708 *Enterococcus faecium* (DOE) ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 1614 *Enterococcus faecalis* EC-yicP ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 2433 *Clostridium difficile* EC-yicP ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 2983 *Clostridium acetobutylicum* 789012\_C3\_19 ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 1285 *Borrelia burgdorferi* BBK17 ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 657 *Bacillus subtilis* yera ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_2 1453 *Bacillus subtilis* adeC ADENINE DEAMINASE (EC 3\_5\_4\_2)  
 3\_5\_4\_23 1867 *Clostridium acetobutylicum* 4812802\_C2\_34 BLASTICIDIN-S DEAMINASE (EC 3\_5\_4\_23)  
 3\_5\_4\_25 5338 *Yersinia pseudotuberculosis* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 455 *Yersinia pestis* EC-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 5088 *Vibrio cholerae* El Tor N16961 ORF01642 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 1207 *Streptococcus pneumoniae* BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-  
 DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 834 *Staphylococcus aureus* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-  
 2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 2864 *Salmonella typhimurium* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 2438 *Salmonella typhi* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 180 *Salmonella paratyphi* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 1712 *Salmonella enteritidis* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 310 *Salmonella dublin* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 6270 *Saccharomyces cerevisiae* RIB1 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 488 *Pseudomonas aeruginosa* ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-  
 2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 5047 *Pseudomonas aeruginosa* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 220 *Porphyromonas gingivalis* BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-  
 DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 1612 *Pasteurella multocida* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 81 *Neisseria gonorrhoeae* EC-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)



3\_5\_4\_25 1778 *Neisseria gonorrhoeae* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 423 *Mycobacterium tuberculosis* ribA2 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 879 *Mycobacterium tuberculosis* Rv0756c GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 1360 *Mycobacterium tuberculosis* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 2032 *Mycobacterium leprae* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 2059 *Mycobacterium leprae* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 624 *Mycobacterium bovis* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 804 *Mycobacterium bovis* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 4007 *Mycobacterium bovis* BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 3514 *Klebsiella pneumoniae* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 3515 *Klebsiella pneumoniae* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 225 *Helicobacter pylori* HP0802 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 227 *Helicobacter pylori* HP0804 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 737 *Helicobacter pylori* J99 ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 739 *Helicobacter pylori* J99 ribBA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 467 *Haemophilus influenzae* HI0212 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 692 *Haemophilus ducreyi* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 4850 *Escherichia coli* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 994 *Corynebacterium diphtheriae* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 3267 *Clostridium difficile* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 1404 *Clostridium acetobutylicum* 5938828\_C2\_49 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 700 *Chlamydia trachomatis* D/UW-3/Cx BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 997 *Chlamydia pneumoniae* AR39 CP0997 GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 804 *Chlamydia pneumoniae* CWL029 BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 1429 *Campylobacter jejuni* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 1805 *Campylobacter jejuni* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)  
 3\_5\_4\_25 3710 *Bordetella pertussis* BS-ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 5964 *Bordetella bronchiseptica* GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_25 2322 *Bacillus subtilis* ribA GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25) / 3,4-DIHYDROXY-2-BUTANONE 4-PHOSPHATE SYNTHASE (EC 4\_1\_2\_-)  
 3\_5\_4\_26 4162 *Yersinia pseudotuberculosis* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 2738 *Yersinia pestis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 6045 *Vibrio cholerae* El Tor N16961 ORF02878  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)



3\_5\_4\_26 1209 *Streptococcus pneumoniae* EC-ribD  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 2886 *Staphylococcus aureus* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 3817 *Staphylococcus aureus* EC-ribD  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 5139 *Salmonella typhimurium* ribG DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 4789 *Salmonella typhi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 4743 *Salmonella paratyphi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 4744 *Salmonella paratyphi* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 4745 *Salmonella paratyphi* diaminohydroxyphosphoribosylaminopyrimidine deaminase (EC 3\_5\_4\_26)

3\_5\_4\_26 1289 *Saccharomyces cerevisiae* RIB2 diaminohydroxyphosphoribosylaminopyrimidine deaminase (EC 3\_5\_4\_26)

3\_5\_4\_26 4276 *Saccharomyces cerevisiae* YDL036C diaminohydroxyphosphoribosylaminopyrimidine deaminase (EC 3\_5\_4\_26)

3\_5\_4\_26 7834 *Saccharomyces cerevisiae* YGR169C diaminohydroxyphosphoribosylaminopyrimidine deaminase (EC 3\_5\_4\_26)

3\_5\_4\_26 1372 *Pseudomonas aeruginosa* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1441 *Porphyromonas gingivalis* EC-ribD  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 669 *Pasteurella multocida* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1383 *Neisseria gonorrhoeae* EC-ribD  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 418 *Mycobacterium tuberculosis* ribG  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1752 *Mycobacterium leprae* EC-ribD  
DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1230 *Mycobacterium bovis* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1404 *Mycobacterium bovis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1440 *Klebsiella pneumoniae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1441 *Klebsiella pneumoniae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 885 *Helicobacter pylori* HP1505 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)

3\_5\_4\_26 1385 *Helicobacter pylori* J99tr|Q9ZJB5  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 2004 *Haemophilus influenzae* HI0944  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 694 *Haemophilus ducreyi* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 398 *Escherichia coli* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 992 *Corynebacterium diphtheriae* DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 3269 *Clostridium difficile* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 1406 *Clostridium acetobutylicum* 16182701\_C1\_42  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 699 *Chlamydia trachomatis* D/UW-3/Cx EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 998 *Chlamydia pneumoniae* AR39 CP0998  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 803 *Chlamydia pneumoniae* CWL029 EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 936 *Campylobacter jejuni* ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 1610 *Bordetella pertussis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 8367 *Bordetella bronchiseptica* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_4\_26 2324 *Bacillus subtilis* ribG DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 3\_5\_5\_1 1428 *Streptococcus mutans* BS-ykrU NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 39 *Pseudomonas aeruginosa* PA3598 NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 3034 *Pseudomonas aeruginosa* PA3093 NITRILASE 2 (EC 3\_5\_5\_1)  
 3\_5\_5\_1 20340 *Neurospora crassa* NITRILASE 2 (EC 3\_5\_5\_1)  
 3\_5\_5\_1 862 *Helicobacter pylori* HPI481 NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 1361 *Helicobacter pylori* J99tr|Q9ZJD8 NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 412 *Clostridium difficile* NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 2466 *Clostridium difficile* NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 3229 *Clostridium difficile* NITRILASE 4 (EC 3\_5\_5\_1)  
 3\_5\_5\_1 1693 *Campylobacter jejuni* Cj1056c NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 5705 *Bordetella bronchiseptica* NITRILASE 4 (EC 3\_5\_5\_1)  
 3\_5\_5\_1 6385 *Bordetella bronchiseptica* NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_1 1358 *Bacillus subtilis* ykrU NITRILASE (EC 3\_5\_5\_1)  
 3\_5\_5\_7 471 *Saccharomyces cerevisiae* NIT1 ALIPHATIC NITRILASE (EC 3\_5\_5\_7)  
 3\_6\_1\_10 7046 *Saccharomyces cerevisiae* PHM5 alkaline phosphatase vacuolar precursor (EC 3\_1\_3\_1) / endopolyphosphatase vacuolar precursor (EC 3\_6\_1\_10)  
 3\_6\_1\_11 8103 *Yersinia pseudotuberculosis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1559 *Yersinia pestis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 524 *Vibrio cholerae* El Tor N16961 ORF00977 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 619 *Streptococcus pyogenes* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)

3\_6\_1\_11 25 *Streptococcus mutans* sp. O68579 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1891 *Staphylococcus aureus* BS-yybQ EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1060 *Salmonella typhimurium* ppx EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3524 *Salmonella typhi* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 4705 *Salmonella paratyphi* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 4706 *Salmonella paratyphi* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3071 *Salmonella enteritidis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3073 *Salmonella enteritidis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3811 *Salmonella dublin* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 5463 *Saccharomyces cerevisiae* PPXI EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 288 *Rickettsia prowazekii* RP294 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 7571 *Pseudomonas aeruginosa* ppx EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1572 *Porphyromonas gingivalis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 822 *Pasteurella multocida* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 324 *Neisseria gonorrhoeae* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 333 *Mycobacterium tuberculosis* Rv0496 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 4444 *Mycobacterium tuberculosis* Rv1026 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 352 *Mycobacterium lepraes* sp. P54882 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3674 *Mycobacterium lepraes* sp. O69585 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1305 *Mycobacterium bovis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3786 *Mycobacterium bovis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 8571 *Klebsiella pneumoniae* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 8572 *Klebsiella pneumoniae* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1225 *Helicobacter pylori* HP0278 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 268 *Helicobacter pylori* J99tr|Q9ZMF7 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 16816 *Haemophilus influenzae* HI0695 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 915 *Haemophilus ducreyi* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 2442 *Escherichia coli* ppx EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1939 *Enterococcus faecalis* BS-yybQ EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1940 *Enterococcus faecalis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 615 *Corynebacterium diphtheriae* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3146 *Clostridium difficile* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 2291 *Clostridium acetobutylicum* 4954457\_C2\_16 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 3378 *Clostridium acetobutylicum* 26384687\_F3\_9 EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 2337 *Campylobacter jejuni* Cj0353c EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 2565 *Campylobacter jejuni* Cj1237c EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 1826 *Bordetella pertussis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_11 7067 *Bordetella bronchiseptica* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)  
 3\_6\_1\_22 3886 *Escherichia coli* yjaD NADH PYROPHOSPHATASE (EC 3\_6\_1\_22)  
 3\_6\_1\_26 7057 *Yersinia pseudotuberculosis* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 3635 *Yersinia pestis* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 963 *Salmonella typhimurium* ushB CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 4527 *Salmonella typhi* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 2381 *Salmonella paratyphi* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 2382 *Salmonella paratyphi* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 754 *Salmonella dublin* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 767 *Mycobacterium tuberculosis* cdh CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 31 *Mycobacterium leprae* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 730 *Mycobacterium bovis* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 4423 *Klebsiella pneumoniae* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 291 *Helicobacter pylori* HP0871 CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 804 *Helicobacter pylori* J99tr|Q9ZKX9 CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_26 3816 *Escherichia coli* cdh CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)  
 3\_6\_1\_31 6635 *Yersinia pseudotuberculosis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 2944 *Yersinia pestis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 911 *Streptococcus mutans* PHOSPHORIBOSYL-ATP PYROPHOSPHATASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 1464 *Staphylococcus aureus* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)

3\_6\_1\_31 501 *Salmonella typhimurium* hisE PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 1641 *Salmonella typhi* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 6191 *Salmonella paratyphi* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 2826 *Salmonella enteritidis* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 2328 *Salmonella dublin* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 6837 *Saccharomyces cerevisiae* HIS4 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL  
 DEHYDROGENASE (EC 1\_1\_1\_23)  
 3\_6\_1\_31 1625 *Pseudomonas aeruginosa* hisE PHOSPHORIBOSYL-ATP PYROPHOSPHATASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 1897 *Pasteurella multocida* hisE PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 14 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE  
 (EC 1\_1\_1\_23)  
 3\_6\_1\_31 15 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE  
 (EC 1\_1\_1\_23)  
 3\_6\_1\_31 172 *Neurospora crassa* his-3 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31) / HISTIDINOL DEHYDROGENASE  
 (EC 1\_1\_1\_23)  
 3\_6\_1\_31 1071 *Neisseria gonorrhoeae* PHOSPHORIBOSYL-ATP PYROPHOSPHATASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 5804 *Mycobacterium tuberculosis* hisI PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC  
 3\_6\_1\_31)  
 3\_6\_1\_31 943 *Mycobacterium lepraes*Q49786 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC  
 3\_6\_1\_31)  
 3\_6\_1\_31 4047 *Mycobacterium bovis* PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 473 *Klebsiella pneumoniae* PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 8280 *Haemophilus influenzae* HI0475 PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC  
 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 6489 *Escherichia coli* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 1149 *Clostridium difficile* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 2123 *Clostridium acetobutylicum* 36605067\_C1\_33 PHOSPHORIBOSYL-ATP PYROPHOSPHATASE  
 (EC 3\_6\_1\_31)  
 3\_6\_1\_31 905 *Campylobacter jejuni* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 768 *Bordetella pertussis* PHOSPHORIBOSYL-ATP PYROPHOSPHATASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 7971 *Bordetella bronchiseptica* PHOSPHORIBOSYL-ATP PYROPHOSPHATASE (EC 3\_6\_1\_31)  
 3\_6\_1\_31 3481 *Bacillus subtilis* hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) /  
 PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)  
 3\_6\_1\_35 5832 *Saccharomyces cerevisiae* PMA2 PLASMA MEMBRANE ATPASE 2 (EC 3\_6\_1\_35)  
 3\_6\_1\_35 6176 *Saccharomyces cerevisiae* PMA1 PLASMA MEMBRANE ATPASE 1 (EC 3\_6\_1\_35)  
 3\_6\_1\_35 89 *Neurospora crassa* AAA33561\_1 PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 91 *Neurospora crassa* AAA33563\_1 PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 1775 *Mycobacterium tuberculosis* ctpE PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 1079 *Mycobacterium bovis* PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 2410 *Enterococcus faecium* (DOE) PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 2736 *Enterococcus faecalis* PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_35 699 *Clostridium difficile* PLASMA MEMBRANE ATPASE (EC 3\_6\_1\_35)  
 3\_6\_1\_40 6862 *Yersinia pseudotuberculosis* EC-gppA GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2356 *Yersinia pestis* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE PYROPHOSPHATASE  
 (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2357 *Yersinia pestis* EC-gppA GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)

3\_6\_1\_40 4180 *Vibrio cholerae* El Tor N16961 ORF00428 GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2289 *Salmonella typhimurium* gppA GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2674 *Salmonella typhi* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE PYROPHOSPHATASE  
 (EC 3\_6\_1\_40)  
 3\_6\_1\_40 5572 *Salmonella paratyphi* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 4123 *Salmonella enteritidis* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 4518 *Salmonella dublin* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE PYROPHOSPHATASE  
 (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2198 *Klebsiella pneumoniae* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 2199 *Klebsiella pneumoniae* GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_40 6197 *Escherichia coli* gppA GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE  
 PYROPHOSPHATASE (EC 3\_6\_1\_40)  
 3\_6\_1\_41 6276 *Yersinia pseudotuberculosis* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 856 *Yersinia pestis* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 4307 *Vibrio cholerae* El Tor N16961 ORF00621 BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 927 *Streptococcus pneumoniae* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL)  
 (EC 3\_6\_1\_41)  
 3\_6\_1\_41 6761 *Salmonella typhimurium* apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 1193 *Salmonella typhi* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 5680 *Salmonella paratyphi* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 4165 *Salmonella enteritidis* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 3570 *Salmonella dublin* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 1283 *Saccharomyces cerevisiae* YNL217W BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 1343 *Pseudomonas aeruginosa* PA3087 BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 1652 *Pseudomonas aeruginosa* apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 1901 *Pasteurella multocida* adaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL)  
 (EC 3\_6\_1\_41)  
 3\_6\_1\_41 330 *Neisseria gonorrhoeae* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 2042 *Klebsiella pneumoniae* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 2043 *Klebsiella pneumoniae* BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 4803 *Haemophilus influenzae* HI0551 BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 613 *Haemophilus ducreyi* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL)  
 (EC 3\_6\_1\_41)  
 3\_6\_1\_41 4302 *Escherichia coli* apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)  
 3\_6\_1\_41 2096 *Campylobacter jejuni* Cj0184c BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 8175 *Bordetella bronchiseptica* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE  
 (SYMMETRICAL) (EC 3\_6\_1\_41)  
 3\_6\_1\_41 1164 *Bacillus subtilis* yjbP BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC  
 3\_6\_1\_41)

3\_6\_1\_45 3730 *Yersinia pestis* UDP-SUGAR HYDROLASE PRECURSOR (EC 3\_6\_1\_45)  
 3\_6\_1\_45 3731 *Yersinia pestis* UDP-SUGAR HYDROLASE PRECURSOR (EC 3\_6\_1\_45)  
 3\_6\_1\_45 3538 *Salmonella paratyphi* UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_1\_45 3539 *Salmonella paratyphi* UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_1\_45 3540 *Salmonella paratyphi* UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_1\_45 5139 *Klebsiella pneumoniae* UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_1\_45 5140 *Klebsiella pneumoniae* UDP-SUGAR HYDROLASE PRECURSOR (EC 3\_6\_1\_45)  
 3\_6\_1\_45 621 *Haemophilus ducreyi* UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_1\_45 463 *Escherichia coli* ushA UDP-SUGAR HYDROLASE (EC 3\_6\_1\_45)  
 3\_6\_3\_12 859 *Salmonella dublin* POTASSIUM-TRANSPORTING ATPASE B CHAIN (EC 3\_6\_3\_12)  
 3\_7\_1\_3 1374 *Saccharomyces cerevisiae* YLR231C KYNURENINASE, L-KYNURENINE HYDROLASE {EC 3\_7\_1\_3}  
 3\_7\_1\_3 6310 *Pseudomonas aeruginosa* PA2080 KYNURENINASE, L-KYNURENINE HYDROLASE {EC 3\_7\_1\_3}  
 3\_7\_1\_3 2806 *Bordetella pertussis* BS-ycbU KYNURENINASE, L-KYNURENINE HYDROLASE {EC 3\_7\_1\_3}  
 3\_7\_1\_3 7248 *Bordetella bronchiseptica* BS-ycbU KYNURENINASE, L-KYNURENINE HYDROLASE {EC 3\_7\_1\_3}  
 3\_7\_1\_5 4076 *Salmonella typhimurium* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 749 *Salmonella typhi* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 1959 *Salmonella paratyphi* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 3461 *Salmonella enteritidis* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 6461 *Pseudomonas aeruginosa* PA2471 fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 3003 *Bordetella pertussis* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_7\_1\_5 6490 *Bordetella bronchiseptica* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)  
 3\_8\_1\_2 4935 *Yersinia pseudotuberculosis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 7341 *Yersinia pseudotuberculosis* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 147 *Yersinia pestis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 2388 *Yersinia pestis* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 7114 *Vibrio cholerae* El Tor N16961ORFA00276 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 402 *Streptococcus pyogenes* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1633 *Streptococcus pneumoniae* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 692 *Streptococcus mutans* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1313 *Staphylococcus aureus* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1929 *Salmonella typhimurium* yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 3199 *Salmonella typhimurium* yihX 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1684 *Salmonella typhi* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 4134 *Salmonella typhi* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 3024 *Salmonella paratyphi* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 5762 *Salmonella paratyphi* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 564 *Salmonella enteritidis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 3646 *Salmonella enteritidis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 5071 *Pseudomonas aeruginosa* PA0810 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1154 *Porphyromonas gingivalis* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1725 *Porphyromonas gingivalis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1155 *Pasteurella multocida* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 2688 *Mycobacterium tuberculosis* Rv3376 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 508 *Mycobacterium bovis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 4905 *Klebsiella pneumoniae* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 4906 *Klebsiella pneumoniae* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 4907 *Klebsiella pneumoniae* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 6974 *Klebsiella pneumoniae* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 6975 *Klebsiella pneumoniae* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1100 *Haemophilus ducreyi* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 3317 *Escherichia coli* yrfG 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 3784 *Escherichia coli* yihX 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 4256 *Escherichia coli* yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1626 *Enterococcus faecium* (DOE) 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 2112 *Enterococcus faecium* (DOE) 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)

3\_8\_1\_2 62 *Enterococcus faecalis* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 2290 *Enterococcus faecalis* 2-HALOALKANOIC ACID DEHALOGENASE (EC 3\_8\_1\_2)  
 3\_8\_1\_2 1795 *Clostridium difficile* EC-yjg 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 2747 *Clostridium difficile* 2-HALOALKANOIC ACID DEHALOGENASE (EC 3\_8\_1\_2)  
 3\_8\_1\_2 900 *Bordetella pertussis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 8775 *Bordetella bronchiseptica* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_2 733 *Bacillus subtilis* yfnB 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)  
 3\_8\_1\_3 5385 *Salmonella typhimurium* HALOACETATE DEHALOGENASE H-1 (EC 3\_8\_1\_3)  
 3\_8\_1\_3 4400 *Salmonella enteritidis* HALOACETATE DEHALOGENASE H-1 (EC 3\_8\_1\_3)  
 3\_8\_1\_3 4149 *Salmonella dublin* HALOACETATE DEHALOGENASE H-1 (EC 3\_8\_1\_3)  
 3\_8\_1\_3 5303 *Pseudomonas aeruginosa* PA2086 HALOACETATE DEHALOGENASE H-1 (EC 3\_8\_1\_3)  
 3\_8\_1\_5 758 *Mycobacterium tuberculosis* Rv2296 HALOALKANE DEHALOGENASE (EC 3\_8\_1\_5)  
 3\_8\_1\_5 3093 *Mycobacterium bovis* HALOALKANE DEHALOGENASE (EC 3\_8\_1\_5)  
 4\_1\_1\_1 4824 *Saccharomyces cerevisiae* PDC6 PYRUVATE DECARBOXYLASE ISOZYME 3 (EC 4\_1\_1\_1)  
 4\_1\_1\_1 4833 *Saccharomyces cerevisiae* PDC5 PYRUVATE DECARBOXYLASE ISOZYME 2 (EC 4\_1\_1\_1)  
 4\_1\_1\_1 7934 *Saccharomyces cerevisiae* PDC1 PYRUVATE DECARBOXYLASE ISOZYME 1 (EC 4\_1\_1\_1)  
 4\_1\_1\_1 303 *Neurospora crassa* cfp PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_1)  
 4\_1\_1\_1 20685 *Neurospora crassa* cfp PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_1)  
 4\_1\_1\_1 20695 *Neurospora crassa* cfp PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_1)  
 4\_1\_1\_11 7186 *Yersinia pseudotuberculosis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1810 *Yersinia pestis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1602 *Staphylococcus aureus* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1984 *Salmonella typhimurium* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 2470 *Salmonella typhi* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 5834 *Salmonella paratyphi* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 5835 *Salmonella paratyphi* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3031 *Salmonella enteritidis* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3732 *Salmonella dublin* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3344 *Pseudomonas aeruginosa* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1488 *Porphyromonas gingivalis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1664 *Neisseria gonorrhoeae* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 2983 *Mycobacterium tuberculosis* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3413 *Mycobacterium leprae* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1830 *Klebsiella pneumoniae* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1831 *Klebsiella pneumoniae* ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 995 *Helicobacter pylori* HP0034 ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 30 *Helicobacter pylori* J99 panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 4339 *Escherichia coli* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3278 *Enterococcus faecium* (DOE) ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 1845 *Enterococcus faecalis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 997 *Clostridium acetobutylicum* 29301552\_C3\_56 ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 2250 *Campylobacter jejuni* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 3758 *Bordetella pertussis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 8287 *Bordetella bronchiseptica* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_11 2237 *Bacillus subtilis* panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)  
 4\_1\_1\_18 611 *Vibrio cholerae* El Tor N16961 ORF00395 LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1001 *Streptococcus pneumoniae* EC-IdcC LYSINE DECARBOXYLASE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 2744 *Staphylococcus aureus* LYSINE DECARBOXYLASE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 3502 *Salmonella typhimurium* cadA LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)

- 4\_1\_1\_18 5566 *Salmonella typhimurium* ldcC LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 4701 *Salmonella typhi* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 5801 *Salmonella typhi* LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1174 *Salmonella paratyphi* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1175 *Salmonella paratyphi* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 3120 *Salmonella paratyphi* LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 3562 *Salmonella enteritidis* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 3482 *Salmonella dublin* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 3505 *Pseudomonas aeruginosa* PA1346 LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 450 *Mycobacterium leprae* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1336 *Klebsiella pneumoniae* LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1984 *Klebsiella pneumoniae* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1985 *Klebsiella pneumoniae* LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 186 *Escherichia coli* ldcC LYSINE DECARBOXYLASE, CONSTITUTIVE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 6347 *Escherichia coli* cadA LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1454 *Clostridium acetobutylicum* 30758438\_F3\_26 LYSINE DECARBOXYLASE (EC 4\_1\_1\_18)  
 4\_1\_1\_18 1464 *Bacillus subtilis* cad LYSINE DECARBOXYLASE (EC 4\_1\_1\_18)  
 4\_1\_1\_19 4352 *Yersinia pseudotuberculosis* EC-speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 6955 *Yersinia pseudotuberculosis* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 2552 *Yersinia pestis* EC-speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 4208 *Yersinia pestis* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 7321 *Vibrio cholerae* El Tor N16961ORFA00537 BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 2817 *Staphylococcus aureus* EC-speF ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 5687 *Salmonella typhimurium* speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 5874 *Salmonella typhimurium* adi BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 562 *Salmonella typhi* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3254 *Salmonella typhi* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 81 *Salmonella paratyphi* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 82 *Salmonella paratyphi* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 1216 *Salmonella paratyphi* BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3611 *Salmonella paratyphi* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3612 *Salmonella paratyphi* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3613 *Salmonella paratyphi* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 2159 *Salmonella enteritidis* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3278 *Salmonella dublin* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 6231 *Pseudomonas aeruginosa* speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 8295 *Pseudomonas aeruginosa* PA1818 BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 155 *Pasteurella multocida* speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 1214 *Neisseria gonorrhoeae* EC-speA ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3337 *Klebsiella pneumoniae* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 3338 *Klebsiella pneumoniae* BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 1357 *Helicobacter pylori* HP0422 ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 954 *Helicobacter pylori* J99tr|Q9ZKH4 ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 5745 *Escherichia coli* speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 6338 *Escherichia coli* adi BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 637 *Clostridium difficile* EC-ldcC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 2613 *Clostridium difficile* ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 1982 *Clostridium acetobutylicum* 1220943\_C2\_26 ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 1362 *Campylobacter jejuni* speA ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 329 *Bordetella pertussis* EC-ldcC BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 7892 *Bordetella bronchiseptica* EC-ldcC BIODEGRADATIVE ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)  
 4\_1\_1\_19 27 *Bacillus subtilis* yaaO ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)



4\_1\_1\_2 1184 *Streptococcus mutans* OXALATE DECARBOXYLASE (EC 4\_1\_1\_2)  
 4\_1\_1\_2 1865 *Bacillus subtilis* yoaN OXALATE DECARBOXYLASE (EC 4\_1\_1\_2)  
 4\_1\_1\_2 3319 *Bacillus subtilis* yvrK OXALATE DECARBOXYLASE (EC 4\_1\_1\_2)  
 4\_1\_1\_20 7661 *Yersinia pseudotuberculosis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 476 *Yersinia pestis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 4009 *Vibrio cholerae* El Tor N16961 ORF00180 DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 710 *Streptococcus pneumoniae* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 366 *Streptococcus mutans* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1769 *Staphylococcus aureus* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2068 *Staphylococcus aureus* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5021 *Salmonella typhimurium* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5330 *Salmonella typhimurium* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 506 *Salmonella typhi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2347 *Salmonella typhi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 888 *Salmonella paratyphi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5121 *Salmonella paratyphi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5122 *Salmonella paratyphi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5416 *Salmonella paratyphi* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2484 *Salmonella enteritidis* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2267 *Salmonella dublin* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 3939 *Salmonella dublin* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2460 *Pseudomonas aeruginosa* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 240 *Porphyromonas gingivalis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 110 *Pasteurella multocida* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 231 *Neisseria gonorrhoeae* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 908 *Mycobacterium tuberculosis* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2810 *Mycobacterium leprae* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1681 *Mycobacterium bovis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 8015 *Klebsiella pneumoniae* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 8016 *Klebsiella pneumoniae* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1237 *Helicobacter pylori* HP0290 DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 279 *Helicobacter pylori* J99sp|Q9ZME5 DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 20352 *Haemophilus influenzae* HI0727 DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1138 *Haemophilus ducreyi* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 5689 *Escherichia coli* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1724 *Enterococcus faecium* (DOE) DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2717 *Enterococcus faecalis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 923 *Corynebacterium diphtheriae* DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1939 *Clostridium difficile* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 556 *Clostridium acetobutylicum* 30757716\_C1\_41 DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2273 *Campylobacter jejuni* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 1165 *Bordetella pertussis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 6504 *Bordetella bronchiseptica* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_20 2334 *Bacillus subtilis* lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)  
 4\_1\_1\_25 20388 *Neurospora crassa* TYROSINE DECARBOXYLASE 4 (EC 4\_1\_1\_25)  
 4\_1\_1\_3 4412 *Vibrio cholerae* El Tor N16961 ORF00764 OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4647 *Vibrio cholerae* El Tor N16961 ORF01061 OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 383 *Treponema pallidum* TP0056 OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 384 *Treponema pallidum* TP0057 OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 949 *Treponema pallidum* TP0055 OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 290 *Streptococcus pyogenes* oadA OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 847 *Streptococcus pyogenes* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 920 *Streptococcus mutans* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 695 *Streptococcus equi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 3423 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)

4\_1\_1\_3 3628 *Salmonella typhimurium* oadG OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4131 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4136 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6764 *Salmonella typhimurium* oadA OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6849 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6850 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6851 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6852 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 6853 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7068 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7069 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7070 *Salmonella typhimurium* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 3897 *Salmonella typhi* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4735 *Salmonella typhi* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4736 *Salmonella typhi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 5389 *Salmonella typhi* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 5814 *Salmonella typhi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4876 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4877 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4879 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4880 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4881 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4882 *Salmonella paratyphi* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4088 *Salmonella enteritidis* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4089 *Salmonella enteritidis* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4090 *Salmonella enteritidis* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 160 *Salmonella dublin* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 269 *Salmonella dublin* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1603 *Salmonella dublin* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 2659 *Salmonella dublin* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 8068 *Pseudomonas aeruginosa* PA5435 OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1160 *Porphyromonas gingivalis* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 108 *Pasteurella multocida* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 109 *Pasteurella multocida* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1989 *Pasteurella multocida* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 282 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1415 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1416 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4486 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 4488 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7001 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE GAMMA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7002 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7003 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7004 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7005 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 7006 *Klebsiella pneumoniae* OXALOACETATE DECARBOXYLASE BETA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1019 *Enterococcus faecalis* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 1893 *Campylobacter jejuni* pycB OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 2285 *Bordetella pertussis* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_3 5209 *Bordetella bronchiseptica* OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)  
 4\_1\_1\_31 5142 *Yersinia pseudotuberculosis* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 3962 *Yersinia pestis* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 6395 *Vibrio cholerae* El Tor N16961 ORF03345 PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 317 *Streptococcus pyogenes* ppc PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 1541 *Streptococcus pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 415 *Streptococcus mutans* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)

4\_1\_1\_31 574 *Streptococcus equi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 1817 *Salmonella typhimurium* glu PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 2407 *Salmonella typhi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 2423 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 2424 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 2425 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 2426 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 3604 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 800 *Salmonella dublin* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 6249 *Pseudomonas aeruginosa* ppc PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 701 *Pasteurella multocida* ppc PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 495 *Neisseria gonorrhoeae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 87 *Mycobacterium lepraes* P46710 PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 7477 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 7478 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 7479 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 6941 *Haemophilus influenzae* HI1636 PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 6267 *Escherichia coli* ppc PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 835 *Corynebacterium diphtheriae* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 3819 *Bordetella pertussis* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_31 6715 *Bordetella bronchiseptica* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)  
 4\_1\_1\_36 6572 *Yersinia pseudotuberculosis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 546 *Yersinia pestis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 4097 *Vibrio cholerae* El Tor N16961 ORF00307 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1285 *Streptococcus pyogenes* dpfB PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1286 *Streptococcus pyogenes* dfp PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 988 *Streptococcus pneumoniae* BS-yloI PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 63 *Streptococcus equi* PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1049 *Staphylococcus aureus* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 6016 *Salmonella typhimurium* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 511 *Salmonella typhi* PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1041 *Salmonella paratyphi* PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 482 *Salmonella enteritidis* PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 8 *Pseudomonas aeruginosa* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 651 *Porphyromonas gingivalis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1846 *Pasteurella multocida* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1026 *Neisseria gonorrhoeae* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 438 *Mycobacterium tuberculosis* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 3501 *Mycobacterium leprae* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 2319 *Mycobacterium bovis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 7928 *Klebsiella pneumoniae* PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 7929 *Klebsiella pneumoniae* PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)

4\_1\_1\_36 263 *Helicobacter pylori* HP0841 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 778 *Helicobacter pylori* J99 dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 2027 *Haemophilus influenzae* HI0953 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1180 *Haemophilus ducreyi* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 3559 *Escherichia coli* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 4051 *Enterococcus faecium* (DOE) PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 2106 *Enterococcus faecalis* BS-yloI PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 325 *Corynebacterium diphtheriae* PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 147 *Clostridium difficile* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 2957 *Clostridium acetobutylicum* 26601507\_C3\_23 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 401 *Campylobacter jejuni* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 363 *Borrelia burgdorferi* BB0812 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 978 *Bordetella pertussis* PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 979 *Bordetella pertussis* PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 5054 *Bordetella bronchiseptica* BS-yloI PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_36 1570 *Bacillus subtilis* yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 4\_1\_1\_39 1360 *Bacillus subtilis* ykrW RIBULOSE BISPHOSPHATE CARBOXYLASE LARGE CHAIN (EC 4\_1\_1\_39)  
 4\_1\_1\_4 674 *Clostridium acetobutylicum* 26181517\_C1\_30 ACETOACETATE DECARBOXYLASE (EC 4\_1\_1\_4)  
 4\_1\_1\_41 849 *Streptococcus pyogenes* methylmalonyl-CoA decarboxylase gamma chain (EC 4\_1\_1\_41)  
 4\_1\_1\_41 850 *Streptococcus pyogenes* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 1715 *Streptococcus pyogenes* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 476 *Streptococcus mutans* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 71 *Streptococcus equi* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 1816 *Porphyromonas gingivalis* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 2841 *Escherichia coli* b2919 methylmalonyl-CoA decarboxylase (EC 4\_1\_1\_41)  
 4\_1\_1\_41 1013 *Enterococcus faecalis* METHYLMALONYL-COA DECARBOXYLASE, BETA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_41 1820 *Bacillus subtilis* yngE METHYLMALONYL-COA DECARBOXYLASE, ALPHA-SUBUNIT (EC 4\_1\_1\_41)  
 4\_1\_1\_44 4250 *Yersinia pseudotuberculosis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 7572 *Yersinia pseudotuberculosis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 2087 *Yersinia pestis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 4832 *Yersinia pestis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 1846 *Streptococcus mutans* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 2130 *Pseudomonas aeruginosa* pcaC 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)

4\_1\_1\_44 7194 *Pseudomonas aeruginosa* PA4486 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 872 *Mycobacterium tuberculosis* Rv0771 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 789 *Mycobacterium bovis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 2180 *Klebsiella pneumoniae* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 5197 *Klebsiella pneumoniae* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 1543 *Enterococcus faecium* (DOE) 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 1639 *Bordetella pertussis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_44 4129 *Bacillus subtilis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)  
 4\_1\_1\_47 6602 *Salmonella typhimurium* gcl GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 1394 *Salmonella typhi* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 5604 *Salmonella paratyphi* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 5605 *Salmonella paratyphi* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 5606 *Salmonella paratyphi* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 3006 *Salmonella enteritidis* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 1072 *Salmonella dublin* GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 2835 *Pseudomonas aeruginosa* gcl GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_47 490 *Escherichia coli* gcl GLYOXYLATE CARBOLIGASE (EC 4\_1\_1\_47)  
 4\_1\_1\_48 6735 *Yersinia pseudotuberculosis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 2569 *Yersinia pestis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 1506 *Streptococcus pneumoniae* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 803 *Streptococcus mutans* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 3403 *Staphylococcus aureus* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 861 *Salmonella typhimurium* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 393 *Salmonella typhi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 2877 *Salmonella paratyphi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 2878 *Salmonella paratyphi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 3629 *Pseudomonas aeruginosa* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 1537 *Pasteurella multocida* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 433 *Neisseria gonorrhoeae* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 2112 *Mycobacterium tuberculosis* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 2171 *Mycobacterium lepraes* Q9X7C7 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 3561 *Mycobacterium bovis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 2306 *Klebsiella pneumoniae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 7322 *Klebsiella pneumoniae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 673 *Helicobacter pylori* HP1279 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 1189 *Helicobacter pylori* J99sp|Q9ZJU8 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 6522 *Haemophilus influenzae* gi|1574224|sp|P46451|TRPC\_HAEIN INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)

4\_1\_1\_48 4843 *Escherichia coli* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 1802 *Corynebacterium diphtheriae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 2135 *Corynebacterium diphtheriae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 4\_1\_1\_48 2031 *Clostridium acetobutylicum* 25412825\_F2\_5 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 559 *Campylobacter jejuni* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 1469 *Bordetella pertussis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 7524 *Bordetella bronchiseptica* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_48 2262 *Bacillus subtilis* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48)  
 4\_1\_1\_49 6832 *Yersinia pseudotuberculosis* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 1439 *Yersinia pestis* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 6484 *Vibrio cholerae* El Tor N16961 ORF03469 PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 2060 *Streptococcus mutans* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 173 *Staphylococcus aureus* sp|P51065 PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 5351 *Salmonella typhimurium* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 1007 *Salmonella typhi* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 908 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 3313 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 3315 *Salmonella paratyphi* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 2153 *Salmonella enteritidis* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 4302 *Salmonella dublin* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 5478 *Saccharomyces cerevisiae* PCK1 PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 5220 *Pseudomonas aeruginosa* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 750 *Porphyromonas gingivalis* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 1000 *Pasteurella multocida* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 20565 *Neurospora crassa* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 5601 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 8614 *Klebsiella pneumoniae* PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 16549 *Haemophilus influenzae* HI0809 PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 875 *Haemophilus ducreyi* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 3321 *Escherichia coli* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 2554 *Enterococcus faecium* (DOE) EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 1897 *Campylobacter jejuni* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_49 3050 *Bacillus subtilis* pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)  
 4\_1\_1\_5 5395 *Vibrio cholerae* El Tor N16961 ORF02026 ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 1214 *Streptococcus mutans* ALPHA-ACETOLACTATE DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_5)  
 4\_1\_1\_5 2815 *Staphylococcus aureus* ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 3189 *Staphylococcus aureus* BS-alsD ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 6871 *Klebsiella pneumoniae* ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 6872 *Klebsiella pneumoniae* ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 2212 *Enterococcus faecium* (DOE) ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 2236 *Enterococcus faecalis* BS-alsD ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 815 *Corynebacterium diphtheriae* ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)

4\_1\_1\_5 1109 *Clostridium acetobutylicum* 5117192\_C2\_69 ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_5 3595 *Bacillus subtilis* alsD ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)  
 4\_1\_1\_55 3306 *Bordetella pertussis* 4,5-DIHYDROXYPHTHALATE DECARBOXYLASE (EC 4\_1\_1\_55)  
 4\_1\_1\_55 6711 *Bordetella bronchiseptica* 4,5-DIHYDROXYPHTHALATE DECARBOXYLASE (EC 4\_1\_1\_55)  
 4\_1\_1\_61 365 *Bacillus subtilis* yclC 4-HYDROXYBENZOATE DECARBOXYLASE (EC 4\_1\_1\_61)  
 4\_1\_1\_7 5394 *Pseudomonas aeruginosa* mdIC BENZOYLFORMATE DECARBOXYLASE (EC 4\_1\_1\_7)  
 4\_1\_1\_71 8096 *Yersinia pseudotuberculosis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 2271 *Yersinia pestis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1103 *Staphylococcus aureus* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 5176 *Salmonella typhi* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1817 *Salmonella paratyphi* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 96 *Porphyromonas gingivalis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 965 *Pasteurella multocida* menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 3276 *Mycobacterium tuberculosis* menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 3303 *Mycobacterium leprae* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 435 *Mycobacterium bovis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1475 *Klebsiella pneumoniae* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1476 *Klebsiella pneumoniae* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1477 *Klebsiella pneumoniae* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 1478 *Klebsiella pneumoniae* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 14027 *Haemophilus influenzae* HI0283 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 406 *Haemophilus ducreyi* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 5372 *Escherichia coli* menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 2539 *Enterococcus faecalis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 868 *Corynebacterium diphtheriae* 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_71 3076 *Bacillus subtilis* menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)  
 4\_1\_1\_74 1692 *Staphylococcus aureus* EC-ilvB INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 6069 *Salmonella typhimurium* ipdC INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 2670 *Salmonella typhi* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 705 *Salmonella paratyphi* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 706 *Salmonella paratyphi* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 1536 *Salmonella enteritidis* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 1957 *Salmonella dublin* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 4530 *Mycobacterium tuberculosis* pdc INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 935 *Mycobacterium bovis* EC-ilvB INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 2274 *Klebsiella pneumoniae* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 2275 *Klebsiella pneumoniae* INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_74 399 *Clostridium acetobutylicum* 6645278\_F2\_34 INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)  
 4\_1\_1\_8 5464 *Mycobacterium tuberculosis* oxaA OXALYL-COA DECARBOXYLASE (EC 4\_1\_1\_8)  
 4\_1\_1\_8 357 *Mycobacterium bovis* OXALYL-COA DECARBOXYLASE (EC 4\_1\_1\_8)



- 4\_1\_1\_8 5446 *Escherichia coli* b2373 OXALYL-COA DECARBOXYLASE (EC 4\_1\_1\_8)
- 4\_1\_1\_9 7781 *Pseudomonas aeruginosa* mdcA malonate CoA-transferase (EC 2\_8\_3\_3) / malonyl-CoA decarboxylase (EC 4\_1\_1\_9)
- 4\_1\_1\_9 30 *Mycobacterium tuberculosis* Rv1347c MALONYL-COA DECARBOXYLASE (EC 4\_1\_1\_9)
- 4\_1\_1\_9 1615 *Mycobacterium bovis* MALONYL-COA DECARBOXYLASE (EC 4\_1\_1\_9)
- 4\_1\_1\_9 4215 *Bordetella pertussis* MALONYL-COA DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_9)
- 4\_1\_1\_9 5060 *Bordetella bronchiseptica* MALONYL-COA DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_9)
- 4\_1\_2\_14 6410 *Yersinia pseudotuberculosis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 214 *Yersinia pestis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 4161 *Vibrio cholerae* El Tor N16961 ORF00404 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 65 *Treponema pallidum* TP0568 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 446 *Streptococcus pyogenes* kgdA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 724 *Streptococcus pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 1101 *Streptococcus equi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 1360 *Salmonella typhimurium* kdgA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 5497 *Salmonella typhimurium* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 5843 *Salmonella typhimurium* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 4115 *Salmonella typhi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 5101 *Salmonella typhi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 2241 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 2242 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 2243 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 3815 *Salmonella enteritidis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 4109 *Salmonella enteritidis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 3628 *Salmonella dublin* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 1087 *Pseudomonas aeruginosa* PA3131 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 8418 *Pseudomonas aeruginosa* PA3181 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 1740 *Pasteurella multocida* eda 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 277 *Neisseria gonorrhoeae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 5072 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 6953 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 7195 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 7843 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_14 500 *Helicobacter pylori* HP1099 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)



4\_1\_2\_14 1015 *Helicobacter pylori* J99tr|Q9ZKB4 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 14548 *Haemophilus influenzae* HI0047 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 5133 *Escherichia coli* eda 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 2271 *Enterococcus faecium* (DOE) 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 2301 *Enterococcus faecium* (DOE) 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 79 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 393 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 831 *Enterococcus faecalis* PUTATIVE 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 1306 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 1071 *Clostridium difficile* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 297 *Clostridium acetobutylicum* 19572687\_C2\_88 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 1115 *Clostridium acetobutylicum* 34181562\_C3\_79 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_14 2207 *Bacillus subtilis* kdgA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_2\_15 5531 *Yersinia pseudotuberculosis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 6917 *Yersinia pseudotuberculosis* EC-aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 7959 *Yersinia pseudotuberculosis* EC-aroH PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 320 *Yersinia pestis* EC-aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 4326 *Yersinia pestis* EC-aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 4724 *Yersinia pestis* EC-aroH PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 4553 *Vibrio cholerae* El Tor N16961 ORF00939 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 5319 *Vibrio cholerae* El Tor N16961 ORF01927 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 7536 *Vibrio cholerae* El Tor N16961ORFA00805 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1076 *Streptococcus pyogenes* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 965 *Streptococcus pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 966 *Streptococcus pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1257 *Streptococcus mutans* EC-aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 443 *Streptococcus equi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 2048 *Staphylococcus aureus* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 1972 *Salmonella typhimurium* aroH PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 3911 *Salmonella typhimurium* aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 4140 *Salmonella typhimurium* aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)

- 4\_1\_2\_15 961 *Salmonella typhi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3475 *Salmonella typhi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 5804 *Salmonella typhi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 2333 *Salmonella paratyphi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 2694 *Salmonella paratyphi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 2695 *Salmonella paratyphi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3203 *Salmonella paratyphi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 1291 *Salmonella enteritidis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 2537 *Salmonella enteritidis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3844 *Salmonella dublin* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 1644 *Saccharomyces cerevisiae* ARO3 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHENYLALANINE-INHIBITED (EC 4\_1\_2\_15)
- 4\_1\_2\_15 8655 *Saccharomyces cerevisiae* ARO4 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 5102 *Pseudomonas aeruginosa* PA2943 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 6050 *Pseudomonas aeruginosa* PA2843 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 7298 *Pseudomonas aeruginosa* PA1750 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 8293 *Pseudomonas aeruginosa* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 400 *Porphyromonas gingivalis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)
- 4\_1\_2\_15 319 *Pasteurella multocida* aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 1600 *Pasteurella multocida* aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 802 *Neisseria gonorrhoeae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)
- 4\_1\_2\_15 1286 *Neisseria gonorrhoeae* EC-aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 4505 *Mycobacterium tuberculosis* aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 526 *Mycobacterium lepraetr* O69569 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 368 *Mycobacterium bovis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3058 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3059 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 3060 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 6421 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 6423 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 6424 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_15 7337 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)

4\_1\_2\_15 7338 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 7339 *Klebsiella pneumoniae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1088 *Helicobacter pylori* HP0134 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 125 *Helicobacter pylori* J99tr|Q9ZMU5 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 15004 *Haemophilus influenzae* HI1547 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 763 *Haemophilus ducreyi* EC-aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 956 *Haemophilus ducreyi* EC-aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 721 *Escherichia coli* aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1661 *Escherichia coli* aroH PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TRP-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 5569 *Escherichia coli* aroF PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, TYR-SENSITIVE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 2436 *Enterococcus faecium* (DOE) PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 1359 *Enterococcus faecalis* BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 1266 *Corynebacterium diphtheriae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1995 *Clostridium difficile* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 2421 *Clostridium difficile* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 1750 *Clostridium acetobutylicum* 954438\_F2\_8 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 363 *Chlamydia trachomatis* D/UW-3/Cx BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 270 *Chlamydia pneumoniae* AR39 CP0270 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 440 *Chlamydia pneumoniae* CWL029 BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_15 137 *Campylobacter jejuni* Cj0716 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 1573 *Bordetella pertussis* EC-aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 8494 *Bordetella bronchiseptica* EC-aroG PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15)  
 4\_1\_2\_15 2969 *Bacillus subtilis* aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 4\_1\_2\_16 6231 *Yersinia pseudotuberculosis* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 1829 *Yersinia pestis* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 5962 *Vibrio cholerae* El Tor N16961 ORF02751 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 4078 *Salmonella typhimurium* kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 2152 *Salmonella typhi* 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 4666 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 61 *Rickettsia prowazekii* RP062 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 8051 *Pseudomonas aeruginosa* kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)

4\_1\_2\_16 1570 *Porphyromonas gingivalis* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE  
 ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 324 *Pasteurella multocida* kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 1665 *Neisseria gonorrhoeae* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE  
 (EC 4\_1\_2\_16)  
 4\_1\_2\_16 3438 *Klebsiella pneumoniae* 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 969 *Helicobacter pylori* HP0003 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 3 *Helicobacter pylori* J99sp|Q9ZN55 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE  
 (EC 4\_1\_2\_16)  
 4\_1\_2\_16 11308 *Haemophilus influenzae* HI1557 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE  
 (EC 4\_1\_2\_16)  
 4\_1\_2\_16 271 *Haemophilus ducreyi* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 1177 *Escherichia coli* kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 626 *Chlamydia trachomatis* D/UW-3/Cx EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE  
 ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 25 *Chlamydia pneumoniae* AR39 CP0025 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE  
 ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 664 *Chlamydia pneumoniae* CWL029 EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE  
 ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_16 2385 *Campylobacter jejuni* kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 1063 *Bordetella pertussis* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC  
 4\_1\_2\_16)  
 4\_1\_2\_16 6011 *Bordetella bronchiseptica* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE  
 ALDOLASE (EC 4\_1\_2\_16)  
 4\_1\_2\_17 6744 *Yersinia pseudotuberculosis* BS-ykrY L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 7683 *Yersinia pseudotuberculosis* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3536 *Yersinia pestis* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 1527 *Streptococcus pneumoniae* EC-fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3729 *Salmonella typhimurium* ygbL L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 5533 *Salmonella typhimurium* prd L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3718 *Salmonella typhi* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3851 *Salmonella typhi* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3829 *Salmonella paratyphi* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 5997 *Salmonella paratyphi* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 2207 *Salmonella enteritidis* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3947 *Salmonella enteritidis* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3825 *Salmonella dublin* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 985 *Pseudomonas aeruginosa* PA1683 L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 5307 *Pseudomonas aeruginosa* PA0224 L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 333 *Pasteurella multocida* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 393 *Mycobacterium tuberculosis* fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 2434 *Mycobacterium leprae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 2730 *Mycobacterium bovis* EC-fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 4048 *Klebsiella pneumoniae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 4147 *Klebsiella pneumoniae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 4405 *Klebsiella pneumoniae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 6986 *Klebsiella pneumoniae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 6987 *Klebsiella pneumoniae* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 5748 *Haemophilus influenzae* HI1012 L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 17016 *Haemophilus influenzae* HI0611 L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 2667 *Escherichia coli* b2738 L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 5667 *Escherichia coli* fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 2219 *Clostridium difficile* L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 3619 *Bordetella pertussis* EC-fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 6805 *Bordetella bronchiseptica* EC-fucA L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)  
 4\_1\_2\_17 1362 *Bacillus subtilis* ykrY L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)

- 4\_1\_2\_19 7795 *Yersinia pseudotuberculosis* EC-rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 412 *Yersinia pestis* EC-rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 2637 *Salmonella typhimurium* rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 3302 *Salmonella typhi* RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 414 *Salmonella paratyphi* RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 1095 *Salmonella enteritidis* RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 2235 *Salmonella dublin* RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 8729 *Klebsiella pneumoniae* RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 6240 *Escherichia coli* rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 3547 *Enterococcus faecium* (DOE) RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_19 1295 *Enterococcus faecalis* EC-rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_20 4593 *Salmonella typhimurium* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_20 1544 *Salmonella typhi* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_20 5792 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_20 3848 *Salmonella enteritidis* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_20 3079 *Klebsiella pneumoniae* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_20 5841 *Escherichia coli* yhaF 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_21 110 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21) / GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)
- 4\_1\_2\_21 111 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21)
- 4\_1\_2\_21 6545 *Escherichia coli* yidU 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21) / GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)
- 4\_1\_2\_25 3510 *Yersinia pestis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 4390 *Vibrio cholerae* El Tor N16961 ORF00733 DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 944 *Streptococcus pyogenes* folQ DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 612 *Streptococcus pneumoniae* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3) / DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2513 *Staphylococcus aureus* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2013 *Salmonella typhimurium* folB DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 149 *Salmonella typhi* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2135 *Salmonella paratyphi* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 3310 *Salmonella enteritidis* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 3074 *Salmonella dublin* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2504 *Pseudomonas aeruginosa* folB DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1273 *Porphyromonas gingivalis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1066 *Pasteurella multocida* folB DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 234 *Neisseria gonorrhoeae* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2977 *Mycobacterium tuberculosis* folX DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 3074 *Mycobacterium leprae* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 3971 *Mycobacterium bovis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 4840 *Klebsiella pneumoniae* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 4841 *Klebsiella pneumoniae* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 890 *Helicobacter pylori* HP1510 DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1390 *Helicobacter pylori* J99tr[Q9ZJB0] DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 14065 *Haemophilus influenzae* tn[G3212189] DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 367 *Haemophilus ducreyi* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 5812 *Escherichia coli* ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1277 *Enterococcus faecalis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 483 *Corynebacterium diphtheriae* DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1997 *Clostridium difficile* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 986 *Clostridium acetobutylicum* 23626540\_C2\_46 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3) / DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 585 *Chlamydia trachomatis* D/UW-3/Cx folX DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 1115 *Chlamydia pneumoniae* AR39 CP1115 DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 695 *Chlamydia pneumoniae* CWL029 folX DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 3000 *Campylobacter jejuni* Cj0356c DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 2920 *Bordetella pertussis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_25 7054 *Bordetella bronchiseptica* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)

- 4\_1\_2\_25 78 *Bacillus subtilis* folA DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_29 3960 *Bacillus subtilis* iolJ 5-DEHYDRO-2-DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_29)
- 4\_1\_2\_40 421 *Streptococcus pyogenes* lacD\_1 TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 611 *Streptococcus pyogenes* lacD\_2 TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 138 *Streptococcus pneumoniae* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 752 *Streptococcus mutans* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 1093 *Streptococcus mutans* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 593 *Streptococcus equi* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 2823 *Staphylococcus aureus* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 4673 *Salmonella typhi* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 4295 *Salmonella enteritidis* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 2692 *Enterococcus faecium* (DOE) TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 354 *Enterococcus faecalis* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_40 2228 *Enterococcus faecalis* TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_5 2794 *Staphylococcus aureus* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 1247 *Salmonella typhi* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 6191 *Saccharomyces cerevisiae* GLY1 LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 931 *Pseudomonas aeruginosa* ltaA LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 310 *Porphyromonas gingivalis* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 1516 *Klebsiella pneumoniae* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 4670 *Escherichia coli* b0870 LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 12 *Clostridium acetobutylicum* 36335840\_F1\_16 LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_2\_5 2247 *Bordetella pertussis* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_3\_1 7359 *Yersinia pseudotuberculosis* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 3554 *Yersinia pestis* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 4591 *Vibrio cholerae* El Tor N16961 ORF00992 ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1226 *Salmonella typhimurium* aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 528 *Salmonella typhi* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 6229 *Salmonella paratyphi* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1182 *Salmonella enteritidis* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 738 *Salmonella dublin* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2432 *Saccharomyces cerevisiae* ICL2 ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 3914 *Saccharomyces cerevisiae* ICL1 ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 4897 *Pseudomonas aeruginosa* PA2634 ISOCITRATE LYASE 1 (EC 4\_1\_3\_1)
- 4\_1\_3\_1 63 *Neurospora crassa* acu-3 ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 3368 *Mycobacterium tuberculosis* aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 4041 *Mycobacterium tuberculosis* aceAb ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 5766 *Mycobacterium tuberculosis* aceAa ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1029 *Mycobacterium leprae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2408 *Mycobacterium leprae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2409 *Mycobacterium leprae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2410 *Mycobacterium leprae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2411 *Mycobacterium leprae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 702 *Mycobacterium bovis* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 703 *Mycobacterium bovis* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 2136 *Mycobacterium bovis* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1222 *Klebsiella pneumoniae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1550 *Klebsiella pneumoniae* ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 493 *Escherichia coli* b0510 ISOCITRATE LYASE 1 (EC 4\_1\_3\_1)
- 4\_1\_3\_1 3901 *Escherichia coli* aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 1753 *Bordetella pertussis* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_1 7593 *Bordetella bronchiseptica* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_12 4182 *Yersinia pseudotuberculosis* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 5095 *Yersinia pseudotuberculosis* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 3849 *Yersinia pestis* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 4731 *Yersinia pestis* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 6247 *Vibrio cholerae* El Tor N16961 ORF03146 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 358 *Streptococcus pneumoniae* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 1050 *Streptococcus mutans* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_12 1198 *Staphylococcus aureus* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)

4\_1\_3\_12 2790 *Staphylococcus aureus* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 995 *Salmonella typhimurium* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 1677 *Salmonella typhi* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3571 *Salmonella paratyphi* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3572 *Salmonella paratyphi* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 183 *Saccharomyces cerevisiae* LYS20 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3023 *Saccharomyces cerevisiae* LEU4 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 6771 *Saccharomyces cerevisiae* YOR108W 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 7705 *Saccharomyces cerevisiae* LYS21 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3621 *Pseudomonas aeruginosa* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 6448 *Pseudomonas aeruginosa* PA1217 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 1213 *Pasteurella multocida* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 993 *Neisseria gonorrhoeae* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 4371 *Mycobacterium tuberculosis* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 2367 *Mycobacterium leprae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 74 *Mycobacterium bovis* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 4248 *Klebsiella pneumoniae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 4249 *Klebsiella pneumoniae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 5177 *Klebsiella pneumoniae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 5179 *Klebsiella pneumoniae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 5686 *Haemophilus influenzae* HI0986 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 4321 *Escherichia coli* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 129 *Corynebacterium diphtheriae* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 550 *Clostridium difficile* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 1680 *Clostridium acetobutylicum* 24265967\_C2\_41 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 1711 *Clostridium acetobutylicum* 49092\_C1\_27 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 2237 *Clostridium acetobutylicum* 1364025\_C2\_25 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3976 *Clostridium acetobutylicum* 23602165\_C2\_4 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 1071 *Campylobacter jejuni* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 2611 *Bordetella pertussis* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 3080 *Bordetella pertussis* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 5502 *Bordetella bronchiseptica* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 6737 *Bordetella bronchiseptica* 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_12 2822 *Bacillus subtilis* leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)  
 4\_1\_3\_16 6410 *Yersinia pseudotuberculosis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 214 *Yersinia pestis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 4161 *Vibrio cholerae* El Tor N16961 ORF00404 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 65 *Treponema pallidum* TP0568 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 446 *Streptococcus pyogenes* kgdA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 724 *Streptococcus pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 1101 *Streptococcus equi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 1360 *Salmonella typhimurium* kgdA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 5497 *Salmonella typhimurium* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 5843 *Salmonella typhimurium* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 4115 *Salmonella typhi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)  
 4\_1\_3\_16 5101 *Salmonella typhi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)



- 4\_1\_3\_16 2241 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 2242 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 2243 *Salmonella paratyphi* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 3815 *Salmonella enteritidis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 4109 *Salmonella enteritidis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 3628 *Salmonella dublin* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1087 *Pseudomonas aeruginosa* PA3131 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 8418 *Pseudomonas aeruginosa* PA3181 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1740 *Pasteurella multocida* eda 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 277 *Neisseria gonorrhoeae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 5072 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 6953 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 7195 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 7843 *Klebsiella pneumoniae* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 500 *Helicobacter pylori* HP1099 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1015 *Helicobacter pylori* J99tr|Q9ZKB4 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 14548 *Haemophilus influenzae* HI0047 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 5133 *Escherichia coli* eda 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 2271 *Enterococcus faecium* (DOE) 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 2301 *Enterococcus faecium* (DOE) 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 79 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 393 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 831 *Enterococcus faecalis* PUTATIVE 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1306 *Enterococcus faecalis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1071 *Clostridium difficile* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 297 *Clostridium acetobutylicum* 19572687\_C2\_88 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 1115 *Clostridium acetobutylicum* 34181562\_C3\_79 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_16 2207 *Bacillus subtilis* kdgA 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3- DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_19 1019 *Treponema pallidum* TP0562 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)
- 4\_1\_3\_19 1131 *Helicobacter pylori* HP0178 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)
- 4\_1\_3\_19 170 *Helicobacter pylori* J99tr|Q9ZMQ2 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)
- 4\_1\_3\_19 1738 *Enterococcus faecium* (DOE) N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)
- 4\_1\_3\_19 1329 *Clostridium acetobutylicum* 24433467\_C1\_46 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)



4\_1\_3\_19 2713 *Campylobacter jejuni* neuB3 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)  
 4\_1\_3\_19 2893 *Campylobacter jejuni* neuB1 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)  
 4\_1\_3\_19 2934 *Campylobacter jejuni* neuB2 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)  
 4\_1\_3\_19 3780 *Bacillus subtilis* spsE N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)  
 4\_1\_3\_2 7360 *Yersinia pseudotuberculosis* EC-aceB MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 903 *Yersinia pestis* EC-aceB MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 4589 *Vibrio cholerae* El Tor N16961 ORF00990 MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 1227 *Salmonella typhimurium* mas MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 4448 *Salmonella typhi* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 6227 *Salmonella paratyphi* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 6228 *Salmonella paratyphi* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 3519 *Salmonella enteritidis* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 737 *Salmonella dublin* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 6774 *Saccharomyces cerevisiae* DAL7 MALATE SYNTHASE 2, GLYOXYSOMAL (EC 4\_1\_3\_2)  
 4\_1\_3\_2 6809 *Saccharomyces cerevisiae* MLS1 MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 593 *Pseudomonas aeruginosa* glcB MALATE SYNTHASE (EC 4\_1\_3\_2)  
 4\_1\_3\_2 66 *Neurospora crassa* acu-9 MALATE SYNTHASE, GLYOXYSOMAL (EC 4\_1\_3\_2)  
 4\_1\_3\_2 285 *Mycobacterium tuberculosis* glcB MALATE SYNTHASE (EC 4\_1\_3\_2)  
 4\_1\_3\_2 3430 *Mycobacterium leprae* EC-glcB PROBABLE MALATE SYNTHASE (EC 4\_1\_3\_2)  
 4\_1\_3\_2 2609 *Mycobacterium bovis* EC-glcB MALATE SYNTHASE (EC 4\_1\_3\_2)  
 4\_1\_3\_2 1168 *Klebsiella pneumoniae* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 1169 *Klebsiella pneumoniae* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 1224 *Klebsiella pneumoniae* MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 3900 *Escherichia coli* aceB MALATE SYNTHASE A (EC 4\_1\_3\_2)  
 4\_1\_3\_2 5763 *Escherichia coli* glcB MALATE SYNTHASE G (EC 4\_1\_3\_2)  
 4\_1\_3\_2 4391 *Bordetella pertussis* EC-glcB MALATE SYNTHASE (EC 4\_1\_3\_2)  
 4\_1\_3\_2 6687 *Bordetella bronchiseptica* PROBABLE MALATE SYNTHASE G (EC 4\_1\_3\_2)  
 4\_1\_3\_21 1649 *Clostridium acetobutylicum* 4775328\_C2\_27 HOMOCITRATE SYNTHASE, OMEGA SUBUNIT (EC 4\_1\_3\_21)  
 4\_1\_3\_21 3588 *Clostridium acetobutylicum* 6835963\_C3\_7 HOMOCITRATE SYNTHASE, ALPHA SUBUNIT (EC 4\_1\_3\_21)  
 4\_1\_3\_21 3589 *Clostridium acetobutylicum* 9773962\_C2\_5' HOMOCITRATE SYNTHASE, OMEGA SUBUNIT (EC 4\_1\_3\_21)  
 4\_1\_3\_27 199 *Yersinia pseudotuberculosis* EC-trpE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 6368 *Yersinia pseudotuberculosis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 6734 *Yersinia pseudotuberculosis* EC-trpD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 6855 *Yersinia pseudotuberculosis* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 8216 *Yersinia pseudotuberculosis* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 961 *Yersinia pestis* trpQ9Z396 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2464 *Yersinia pestis* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2570 *Yersinia pestis* EC-trpD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2571 *Yersinia pestis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2572 *Yersinia pestis* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 4999 *Vibrio cholerae* El Tor N16961 ORF01525 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 5000 *Vibrio cholerae* El Tor N16961 ORF01526 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 6368 *Vibrio cholerae* El Tor N16961 ORF03313 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 504 *Streptococcus pyogenes* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1028 *Streptococcus pyogenes* trpG PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 767 *Streptococcus pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)

- 4\_1\_3\_27 1392 *Streptococcus pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1503 *Streptococcus pneumoniae* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1504 *Streptococcus pneumoniae* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 1764 *Streptococcus pneumoniae* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 252 *Streptococcus mutans* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 970 *Streptococcus mutans* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1227 *Streptococcus mutans* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1752 *Streptococcus mutans* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 793 *Streptococcus equi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2493 *Staphylococcus aureus* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2749 *Staphylococcus aureus* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3400 *Staphylococcus aureus* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3401 *Staphylococcus aureus* trpQ9RL76 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 858 *Salmonella typhimurium* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 859 *Salmonella typhimurium* trpGD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3998 *Salmonella typhimurium* pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 1035 *Salmonella typhi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1037 *Salmonella typhi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3410 *Salmonella typhi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2879 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2881 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2882 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2883 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2884 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2885 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2886 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2887 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2888 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 4839 *Salmonella paratyphi* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2434 *Salmonella enteritidis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3775 *Salmonella enteritidis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3776 *Salmonella enteritidis* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3893 *Salmonella dublin* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3895 *Salmonella dublin* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 5990 *Saccharomyces cerevisiae* TRP3 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 6124 *Saccharomyces cerevisiae* TRP2 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 395 *Rickettsia prowazekii* RP404 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 298 *Pseudomonas aeruginosa* phnA ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 299 *Pseudomonas aeruginosa* phnB ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3667 *Pseudomonas aeruginosa* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)

4\_1\_3\_27 6418 *Pseudomonas aeruginosa* trpG ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) /  
 PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 8011 *Pseudomonas aeruginosa* PA0297 ANTHRANILATE SYNTHASE COMPONENT II (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 327 *Porphyromonas gingivalis* PARA-AMINO BENZOATE SYNTHASE COMPONENT I (EC 4\_1\_3\_-)  
 / ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1734 *Porphyromonas gingivalis* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC  
 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II  
 (EC 4\_1\_3\_-)  
 4\_1\_3\_27 369 *Pasteurella multocida* trpG\_2 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) /  
 PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 371 *Pasteurella multocida* PARA-AMINO BENZOATE SYNTHASE COMPONENT I (EC 4\_1\_3\_-) /  
 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1540 *Pasteurella multocida* trpG\_1 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) /  
 PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 1541 *Pasteurella multocida* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 968 *Neisseria gonorrhoeae* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 1449 *Neisseria gonorrhoeae* sp|Q9WW00 ANTHRANILATE SYNTHASE COMPONENT I (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 72 *Mycobacterium tuberculosis* pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 596 *Mycobacterium tuberculosis* trpE2 ANTHRANILATE SYNTHASE COMPONENT I (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 2116 *Mycobacterium tuberculosis* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 4216 *Mycobacterium tuberculosis* Rv2859c ANTHRANILATE SYNTHASE COMPONENT II (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 761 *Mycobacterium leprae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1472 *Mycobacterium leprae* trpQ50183 ANTHRANILATE SYNTHASE COMPONENT II (EC  
 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II  
 (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2925 *Mycobacterium leprae* sp|Q9X7C5 ANTHRANILATE SYNTHASE COMPONENT I (EC  
 4\_1\_3\_27)  
 4\_1\_3\_27 451 *Mycobacterium bovis* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2432 *Mycobacterium bovis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2499 *Mycobacterium bovis* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3452 *Mycobacterium bovis* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 2307 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2308 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2309 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2310 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2311 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 6347 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) /  
 PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 6836 *Klebsiella pneumoniae* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 675 *Helicobacter pylori* HP1281 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) /  
 PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC  
 4\_1\_3\_-)  
 4\_1\_3\_27 676 *Helicobacter pylori* HP1282 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1731 *Helicobacter pylori* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 1190 *Helicobacter pylori* J99sp|Q9ZJU7 ANTHRANILATE SYNTHASE COMPONENT II (EC  
 4\_1\_3\_27)

4\_1\_3\_27 1191 *Helicobacter pylori* J99tr|Q9ZJU6 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 1192 *Helicobacter pylori* J99sp|Q9ZJU5 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2504 *Haemophilus influenzae* HI1171 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2923 *Haemophilus influenzae* HI1388 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 10186 *Haemophilus influenzae* HI1387 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 788 *Haemophilus ducreyi* PARA-AMINOBENZOATE SYNTHASE COMPONENT I (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 791 *Haemophilus ducreyi* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 1258 *Escherichia coli* b1298 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 4844 *Escherichia coli* trpD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) [INCLUDES: GLUTAMINE AMIDOTRANSFERASE; ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)]  
 4\_1\_3\_27 4845 *Escherichia coli* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 5967 *Escherichia coli* pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2186 *Enterococcus faecalis* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2132 *Corynebacterium diphtheriae* ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2133 *Corynebacterium diphtheriae* PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2002 *Clostridium difficile* EC-pabB PARA-AMINOBENZOATE SYNTHASE COMPONENT I (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2003 *Clostridium difficile* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3032 *Clostridium difficile* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3494 *Clostridium difficile* ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2028 *Clostridium acetobutylicum* 29563962\_F1\_2 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2029 *Clostridium acetobutylicum* 4687828\_F1\_3 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2495 *Clostridium acetobutylicum* 34272142\_C3\_23 ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3983 *Clostridium acetobutylicum* 24859412\_C3\_3 ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 336 *Campylobacter jejuni* pabB PARA-AMINOBENZOATE SYNTHASE COMPONENT I (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 338 *Campylobacter jejuni* pabA PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-) / ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2325 *Campylobacter jejuni* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 2326 *Campylobacter jejuni* trpD ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 3233 *Bordetella pertussis* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 3234 *Bordetella pertussis* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 7526 *Bordetella bronchiseptica* EC-pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINOBENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)

4\_1\_3\_27 7527 *Bordetella bronchiseptica* EC-entC ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_27 75 *Bacillus subtilis* pabA ANTHRANILATE SYNTHASE COMPONENT II (EC 4\_1\_3\_27) / PARA-AMINO BENZOATE SYNTHASE GLUTAMINE AMIDOTRANSFERASE COMPONENT II (EC 4\_1\_3\_-)  
 4\_1\_3\_27 2264 *Bacillus subtilis* trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)  
 4\_1\_3\_3 6064 *Yersinia pseudotuberculosis* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 3903 *Yersinia pestis* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 5573 *Vibrio cholerae* El Tor N16961 ORF02257 N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 993 *Streptococcus pyogenes* nanH N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 116 *Streptococcus pneumoniae* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 117 *Streptococcus pneumoniae* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 425 *Streptococcus pneumoniae* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 1162 *Streptococcus equi* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 1742 *Staphylococcus aureus* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 6112 *Salmonella typhimurium* npl N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 4620 *Salmonella typhi* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 1253 *Salmonella paratyphi* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 1263 *Salmonella enteritidis* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 1084 *Pasteurella multocida* nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 14343 *Haemophilus influenzae* HI0142 N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 408 *Haemophilus ducreyi* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 5887 *Escherichia coli* nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_3 3723 *Clostridium difficile* N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)  
 4\_1\_3\_30 5161 *Vibrio cholerae* El Tor N16961 ORF01725 methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 234 *Salmonella typhimurium* prpB methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 1730 *Salmonella typhi* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 3664 *Salmonella paratyphi* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 2850 *Salmonella enteritidis* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 3783 *Pseudomonas aeruginosa* PA4872 methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 5197 *Pseudomonas aeruginosa* prpB methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 6254 *Pseudomonas aeruginosa* PA3682 methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 1609 *Neisseria gonorrhoeae* BS-yqiQ methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 950 *Mycobacterium tuberculosis* Rv1998c methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 1478 *Mycobacterium bovis* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 315 *Escherichia coli* b0331 methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 1087 *Bordetella pertussis* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 2491 *Bordetella pertussis* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 6693 *Bordetella bronchiseptica* methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 8810 *Bordetella bronchiseptica* BS-yqiQ methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_30 2407 *Bacillus subtilis* yqiQ methylisocitrate lyase (EC 4\_1\_3\_30)  
 4\_1\_3\_31 119 *Yersinia pestis* EC-gltA 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 5162 *Vibrio cholerae* El Tor N16961 ORF01726 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 1729 *Salmonella typhi* 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 3663 *Salmonella paratyphi* 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 5198 *Pseudomonas aeruginosa* prpC 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 1611 *Neisseria gonorrhoeae* 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 5645 *Mycobacterium tuberculosis* gltA1 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 954 *Mycobacterium bovis* BS-citZ 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 317 *Escherichia coli* b0333 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 1086 *Bordetella pertussis* BS-citZ 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_31 8811 *Bordetella bronchiseptica* 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_34 287 *Streptococcus pyogenes* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 917 *Streptococcus mutans* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 696 *Streptococcus equi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 3633 *Salmonella typhimurium* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)

4\_1\_3\_34 2134 *Salmonella typhi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 2522 *Salmonella paratyphi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 118 *Klebsiella pneumoniae* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 21806 *Haemophilus influenzae* HI0023 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 628 *Haemophilus ducreyi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 4550 *Escherichia coli* b0616 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_34 1016 *Enterococcus faecalis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_36 8098 *Yersinia pseudotuberculosis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 2269 *Yersinia pestis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 5768 *Vibrio cholerae* El Tor N16961 ORF02490 NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 3007 *Staphylococcus aureus* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 4351 *Salmonella typhimurium* menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 5173 *Salmonella typhi* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 6473 *Salmonella paratyphi* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 1108 *Salmonella dublin* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 95 *Porphyromonas gingivalis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 1815 *Pasteurella multocida* menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 1367 *Mycobacterium tuberculosis* echA13 NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 2374 *Mycobacterium tuberculosis* menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 1738 *Mycobacterium leprae* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 1113 *Mycobacterium bovis* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 2653 *Mycobacterium bovis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 3690 *Klebsiella pneumoniae* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 3691 *Klebsiella pneumoniae* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 5652 *Haemophilus influenzae* HI0968 NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 43 *Haemophilus ducreyi* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 5370 *Escherichia coli* menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 2536 *Enterococcus faecalis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 2346 *Corynebacterium diphtheriae* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 4409 *Bordetella pertussis*trjO30448 NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 8125 *Bordetella bronchiseptica* NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 988 *Bacillus subtilis* yhaR NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_36 3074 *Bacillus subtilis* menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_6 6671 *Yersinia pseudotuberculosis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4345 *Yersinia pestis*trjQ9ZC38 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4653 *Vibrio cholerae* El Tor N16961 ORF01070 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4654 *Vibrio cholerae* El Tor N16961 ORF01071 CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 287 *Streptococcus pyogenes* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 288 *Streptococcus pyogenes* citF CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 917 *Streptococcus mutans* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 918 *Streptococcus mutans* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 694 *Streptococcus equi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 696 *Streptococcus equi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 2196 *Salmonella typhimurium* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3273 *Salmonella typhimurium* citF CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3275 *Salmonella typhimurium* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3633 *Salmonella typhimurium* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 3635 *Salmonella typhimurium* citF CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 162 *Salmonella typhi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 348 *Salmonella typhi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 1898 *Salmonella typhi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)

4\_1\_3\_6 2134 *Salmonella typhi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 95 *Salmonella paratyphi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 96 *Salmonella paratyphi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 97 *Salmonella paratyphi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 98 *Salmonella paratyphi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 317 *Salmonella paratyphi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2522 *Salmonella paratyphi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 2937 *Salmonella paratyphi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 118 *Salmonella enteritidis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2387 *Salmonella enteritidis* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2469 *Salmonella enteritidis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2470 *Salmonella enteritidis* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3790 *Salmonella enteritidis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3083 *Salmonella dublin* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3104 *Salmonella dublin* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3105 *Salmonella dublin* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 6268 *Pseudomonas aeruginosa* PA0883 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 522 *Mycobacterium tuberculosis* Rv3075c CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4601 *Mycobacterium tuberculosis* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 1649 *Mycobacterium leprae* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2914 *Mycobacterium bovis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 3678 *Mycobacterium bovis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 118 *Klebsiella pneumoniae* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 4726 *Klebsiella pneumoniae* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4727 *Klebsiella pneumoniae* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 18181 *Haemophilus influenzae* HI0022 CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 21806 *Haemophilus influenzae* HI0023 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 627 *Haemophilus ducreyi* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 628 *Haemophilus ducreyi* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 526 *Escherichia coli* b0544 CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4549 *Escherichia coli* b0615 CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 4550 *Escherichia coli* b0616 CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 1016 *Enterococcus faecalis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_6 1017 *Enterococcus faecalis* CITRATE LYASE ALPHA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 1987 *Enterococcus faecalis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2268 *Corynebacterium diphtheriae* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 2310 *Bordetella pertussis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 5486 *Bordetella bronchiseptica* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 5759 *Bordetella bronchiseptica* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_6 7363 *Bordetella bronchiseptica* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_7 4686 *Yersinia pseudotuberculosis* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 5885 *Vibrio cholerae* El Tor N16961 ORF02639 CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 152 *Streptococcus mutans* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 2453 *Staphylococcus aureus* EC-gltA CITRATE SYNTHASE II (EC 4\_1\_3\_7)  
 4\_1\_3\_7 87 *Salmonella typhimurium* gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 1944 *Salmonella typhimurium* prpC POSSIBLE CITRATE SYNTHASE 2 (EC 4\_1\_3\_7)  
 4\_1\_3\_7 4064 *Salmonella typhi* CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 62 *Salmonella paratyphi* CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 63 *Salmonella paratyphi* CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 64 *Salmonella paratyphi* CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 1817 *Salmonella enteritidis* CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_3\_7 4559 *Saccharomyces cerevisiae* CIT1 CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR (EC 4\_1\_3\_7)  
 4\_1\_3\_7 6602 *Saccharomyces cerevisiae* CIT2 CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR (EC 4\_1\_3\_7)

- 4\_1\_3\_7 6911 *Saccharomyces cerevisiae* CIT3 CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR (EC 4\_1\_3\_7)
- 4\_1\_3\_7 815 *Rickettsia prowazekii* RP844 CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 8103 *Pseudomonas aeruginosa* gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 406 *Pasteurella multocida* gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 111 *Neurospora crassa* cit1 CITRATE SYNTHASE, MITOCHONDRIAL PRECURSOR (EC 4\_1\_3\_7)
- 4\_1\_3\_7 841 *Neisseria gonorrhoeae* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 707 *Mycobacterium tuberculosis* citA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 4948 *Mycobacterium tuberculosis* gltA2 CITRATE SYNTHASE I (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3309 *Mycobacterium lepraetrj*O33066 CITRATE SYNTHASE I (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3311 *Mycobacterium leprae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3312 *Mycobacterium leprae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3313 *Mycobacterium leprae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 1130 *Mycobacterium bovis* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 4080 *Mycobacterium bovis* BS-citA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3505 *Klebsiella pneumoniae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 3506 *Klebsiella pneumoniae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 988 *Helicobacter pylori* HP0026 CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 22 *Helicobacter pylori* J99 gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 4608 *Escherichia coli* gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 1483 *Corynebacterium diphtheriae* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 502 *Campylobacter jejuni* gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 1095 *Bordetella pertussis* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 4022 *Bordetella pertussis* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 5551 *Bordetella bronchiseptica* CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 9152 *Bordetella bronchiseptica* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_3\_7 943 *Bacillus subtilis* citA CITRATE SYNTHASE I (EC 4\_1\_3\_7)
- 4\_1\_3\_7 2409 *Bacillus subtilis* mmgD CITRATE SYNTHASE III (EC 4\_1\_3\_7)
- 4\_1\_3\_7 2908 *Bacillus subtilis* citZ CITRATE SYNTHASE (EC 4\_1\_3\_7)
- 4\_1\_99\_1 522 *Vibrio cholerae* El Tor N16961ORFA01101 TRYPTOPHANASE (EC 4\_1\_99\_1)
- 4\_1\_99\_1 1988 *Pasteurella multocida* tnaA TRYPTOPHANASE (EC 4\_1\_99\_1)
- 4\_1\_99\_1 3626 *Escherichia coli* tnaA TRYPTOPHANASE (EC 4\_1\_99\_1)
- 4\_1\_99\_2 456 *Porphyromonas gingivalis* TYROSINE PHENOL-LYASE (EC 4\_1\_99\_2)
- 4\_1\_99\_2 892 *Porphyromonas gingivalis* EC-tnaA TYROSINE PHENOL-LYASE (EC 4\_1\_99\_2)
- 4\_1\_99\_2 505 *Pasteurella multocida* TYROSINE PHENOL-LYASE (EC 4\_1\_99\_2)
- 4\_1\_99\_4 7712 *Yersinia pseudotuberculosis* PUTATIVE 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 127 *Yersinia pestis* 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 4628 *Salmonella typhimurium* yedO PUTATIVE 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 4425 *Salmonella typhi* 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 3978 *Salmonella paratyphi* 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 3979 *Salmonella paratyphi* PUTATIVE 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 4482 *Klebsiella pneumoniae* 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 5180 *Escherichia coli* b1919 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_1\_99\_4 9068 *Bordetella bronchiseptica* 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)
- 4\_2\_1\_10 7491 *Yersinia pseudotuberculosis* BS-yqhS 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 2957 *Yersinia pestis* BS-yqhS 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 4173 *Vibrio cholerae* El Tor N16961 ORF00421 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 570 *Streptococcus pyogenes* aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 384 *Streptococcus pneumoniae* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 1622 *Streptococcus mutans* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 1447 *Streptococcus equi* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 2873 *Staphylococcus aureus* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)
- 4\_2\_1\_10 2024 *Salmonella typhimurium* aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)



4\_2\_1\_10 1615 *Salmonella typhi* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 5490 *Salmonella paratyphi* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 4003 *Salmonella enteritidis* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1952 *Salmonella dublin* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 6725 *Pseudomonas aeruginosa* aroQ1 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 6802 *Pseudomonas aeruginosa* aroQ2 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1580 *Porphyromonas gingivalis* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1812 *Pasteurella multocida* aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 244 *Neurospora crassa* qa-2 CATABOLIC 3-DEHYDROQUINASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 252 *Neurospora crassa* CAA24237\_1 CATABOLIC 3-DEHYDROQUINASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 987 *Neisseria gonorrhoeae* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 136 *Mycobacterium tuberculosis* aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 443 *Mycobacterium leprae* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 3333 *Mycobacterium bovis* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1254 *Klebsiella pneumoniae* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1255 *Klebsiella pneumoniae* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 443 *Helicobacter pylori* HP1038 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 388 *Helicobacter pylori* J99 aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 2063 *Haemophilus influenzae* HI0970 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1482 *Haemophilus ducreyi* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1650 *Escherichia coli* aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1019 *Enterococcus faecium* (DOE) 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1025 *Enterococcus faecalis* gi|388110|sp|P36923|EBSD\_ENTFA 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 744 *Corynebacterium diphtheriae* 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1356 *Clostridium difficile* EC-aroD 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1757 *Clostridium acetobutylicum* 24899217\_F2\_10 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1201 *Campylobacter jejuni* aroQ 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 1845 *Bordetella pertussis* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 9466 *Bordetella bronchiseptica* BS-yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 2304 *Bacillus subtilis* aroC 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_10 2442 *Bacillus subtilis* yqHs 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_12 6871 *Yersinia pseudotuberculosis* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 3135 *Yersinia pestis* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 4164 *Vibrio cholerae* El Tor N16961 ORF00409 PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 1361 *Salmonella typhimurium* edd PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 2615 *Salmonella typhi* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 2244 *Salmonella paratyphi* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 2245 *Salmonella paratyphi* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 2246 *Salmonella paratyphi* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 2247 *Salmonella paratyphi* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 3929 *Salmonella enteritidis* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 4514 *Pseudomonas aeruginosa* edd PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 276 *Neisseria gonorrhoeae* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 7844 *Klebsiella pneumoniae* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 7846 *Klebsiella pneumoniae* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 501 *Helicobacter pylori* HP1100 PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 1016 *Helicobacter pylori* J99sp|Q9ZKB3 PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_12 5134 *Escherichia coli* edd PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_14 7381 *Vibrio cholerae* El Tor N16961 ORF00608 D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 5735 *Salmonella typhimurium* dsdA D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 3679 *Salmonella typhi* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 471 *Salmonella paratyphi* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 472 *Salmonella paratyphi* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 3951 *Salmonella dublin* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 179 *Pseudomonas aeruginosa* dsdA D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 3029 *Klebsiella pneumoniae* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 6945 *Klebsiella pneumoniae* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 6946 *Klebsiella pneumoniae* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 2314 *Escherichia coli* dsdA D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)

4\_2\_1\_14 1104 *Clostridium difficile* D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_14 2373 *Bacillus subtilis* yqjR D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_16 4837 *Yersinia pseudotuberculosis* THREONINE DEHYDRATASE BIOSYNTHETIC PRECURSOR (EC 4\_2\_1\_16)  
 4\_2\_1\_16 8030 *Yersinia pseudotuberculosis* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1958 *Yersinia pestis* EC-tdcB THREONINE DEHYDRATASE BIOSYNTHETIC PRECURSOR (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2919 *Yersinia pestis* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3911 *Vibrio cholerae* El Tor N16961 ORF00054 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 674 *Streptococcus pneumoniae* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 684 *Streptococcus mutans* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1298 *Staphylococcus aureus* EC-tdcB THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1647 *Staphylococcus aureus* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1781 *Salmonella typhimurium* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3836 *Salmonella typhimurium* ygeX THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4585 *Salmonella typhimurium* tdcB THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 46 *Salmonella typhi* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 397 *Salmonella typhi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2254 *Salmonella typhi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4878 *Salmonella typhi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1721 *Salmonella paratyphi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1722 *Salmonella paratyphi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3653 *Salmonella paratyphi* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3805 *Salmonella paratyphi* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3843 *Salmonella enteritidis* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3854 *Salmonella enteritidis* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4149 *Salmonella enteritidis* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2775 *Salmonella dublin* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3329 *Salmonella dublin* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4299 *Salmonella dublin* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2461 *Saccharomyces cerevisiae* SRY1 THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4628 *Saccharomyces cerevisiae* ILV1 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 440 *Rickettsia prowazekii* RP449 THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4537 *Pseudomonas aeruginosa* PA2683 THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4943 *Pseudomonas aeruginosa* PA0851 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 5035 *Pseudomonas aeruginosa* ilvA1 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 7477 *Pseudomonas aeruginosa* ilvA2 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 686 *Pasteurella multocida* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 671 *Neisseria gonorrhoeae* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1188 *Mycobacterium tuberculosis* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1586 *Mycobacterium leprae*trjQ9X7F1 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1 *Mycobacterium bovis* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4030 *Klebsiella pneumoniae* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4031 *Klebsiella pneumoniae* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 7398 *Klebsiella pneumoniae* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 7400 *Klebsiella pneumoniae* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1633 *Haemophilus influenzae* spP46493 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2795 *Escherichia coli* b2871 THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 3684 *Escherichia coli* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 5837 *Escherichia coli* tdcB THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 687 *Enterococcus faecalis* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1689 *Corynebacterium diphtheriae* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 741 *Clostridium difficile* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)

4\_2\_1\_16 3502 *Clostridium difficile* EC-tdcB THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 392 *Campylobacter jejuni* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 1673 *Bordetella pertussis* EC-tdcB THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2180 *Bordetella pertussis* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 4320 *Bordetella pertussis* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 6591 *Bordetella bronchiseptica* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 6597 *Bordetella bronchiseptica* THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 7172 *Bordetella bronchiseptica* EC-ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 8269 *Bordetella bronchiseptica* THREONINE DEHYDRATASE CATABOLIC (EC 4\_2\_1\_16)  
 4\_2\_1\_16 2175 *Bacillus subtilis* ilvA THREONINE DEHYDRATASE BIOSYNTHETIC (EC 4\_2\_1\_16)  
 4\_2\_1\_19 6125 *Yersinia pseudotuberculosis* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 362 *Yersinia pestis* EC-hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 4961 *Vibrio cholerae* El Tor N16961 ORF01480 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1156 *Streptococcus mutans* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1911 *Staphylococcus aureus* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 507 *Salmonella typhimurium* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1207 *Salmonella typhi* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1579 *Salmonella paratyphi* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19) / HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)  
 4\_2\_1\_19 294 *Salmonella enteritidis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 8120 *Saccharomyces cerevisiae* HIS3 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 7007 *Pseudomonas aeruginosa* hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1892 *Pasteurella multocida* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 64 *Neisseria gonorrhoeae* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 2630 *Mycobacterium tuberculosis* hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1689 *Mycobacterium leprae* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 2961 *Mycobacterium leprae* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 2257 *Mycobacterium bovis* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 3962 *Klebsiella pneumoniae* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1006 *Haemophilus influenzae* HI0471 HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1970 *Escherichia coli* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 35 *Corynebacterium diphtheriae* IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 1145 *Clostridium difficile* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 2128 *Clostridium acetobutylicum* 6837963\_C3\_40 IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 895 *Campylobacter jejuni* hisB HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15) / IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 763 *Bordetella pertussis* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)

4\_2\_1\_19 7809 *Bordetella bronchiseptica* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_19 3485 *Bacillus subtilis* hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_20 6460 *Yersinia pseudotuberculosis* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 6736 *Yersinia pseudotuberculosis* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 647 *Yersinia pestis* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3957 *Yersinia pestis* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4995 *Vibrio cholerae* El Tor N16961 ORF01518 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4996 *Vibrio cholerae* El Tor N16961 ORF01522 TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1508 *Streptococcus pneumoniae* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1509 *Streptococcus pneumoniae* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 805 *Streptococcus mutans* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1404 *Staphylococcus aureus* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3405 *Staphylococcus aureus* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 851 *Salmonella typhimurium* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 852 *Salmonella typhimurium* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3460 *Salmonella typhi* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4948 *Salmonella typhi* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4920 *Salmonella paratyphi* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4921 *Salmonella paratyphi* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4922 *Salmonella paratyphi* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4923 *Salmonella paratyphi* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 353 *Salmonella dublin* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4883 *Saccharomyces cerevisiae* TRP5 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1312 *Pseudomonas aeruginosa* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2963 *Pseudomonas aeruginosa* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1534 *Pasteurella multocida* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1535 *Pasteurella multocida* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 269 *Neurospora crassa* AAA33616\_1 TRYPTOPHAN SYNTHASE (EC 4\_2\_1\_20)  
 4\_2\_1\_20 20606 *Neurospora crassa* trp-3 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 20628 *Neurospora crassa* trp-3 TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 643 *Neisseria gonorrhoeae* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1681 *Neisseria gonorrhoeae* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2113 *Mycobacterium tuberculosis* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2114 *Mycobacterium tuberculosis* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2172 *Mycobacterium leprae* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3457 *Mycobacterium leprae* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3559 *Mycobacterium bovis* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3560 *Mycobacterium bovis* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 7319 *Klebsiella pneumoniae* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 7320 *Klebsiella pneumoniae* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 7321 *Klebsiella pneumoniae* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 671 *Helicobacter pylori* HP1277 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 672 *Helicobacter pylori* HP1278 TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1187 *Helicobacter pylori* J99sp|Q9ZJV0 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1188 *Helicobacter pylori* J99sp|Q9ZJU9 TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 3006 *Haemophilus influenzae* HI1432 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 6596 *Haemophilus influenzae* HI1431 TRYPTOPHAN SYNTHASE (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4841 *Escherichia coli* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 4842 *Escherichia coli* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 306 *Corynebacterium diphtheriae* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 307 *Corynebacterium diphtheriae* TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 1225 *Corynebacterium diphtheriae* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 211 *Clostridium difficile* TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2033 *Clostridium acetobutylicum* 34267202\_F2\_6 TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2034 *Clostridium acetobutylicum* 34615937\_F3\_10 TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)

4\_2\_1\_20 164 *Chlamydia trachomatis* D/UW-3/Cx EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 165 *Chlamydia trachomatis* D/UW-3/Cx EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2330 *Campylobacter jejuni* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2331 *Campylobacter jejuni* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2780 *Bordetella pertussis* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2781 *Bordetella pertussis* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 6113 *Bordetella bronchiseptica* EC-trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 7952 *Bordetella bronchiseptica* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2259 *Bacillus subtilis* trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_20 2260 *Bacillus subtilis* trpB TRYPTOPHAN SYNTHASE BETA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_28 42 *Salmonella typhimurium*trjO31041 DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 43 *Salmonella typhimurium*trjO31042 DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 1801 *Salmonella typhi* DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 1802 *Salmonella typhi* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 2912 *Salmonella paratyphi* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 2913 *Salmonella paratyphi* DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 7210 *Salmonella paratyphi* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 406 *Salmonella enteritidis* DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 3581 *Salmonella enteritidis* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 2688 *Salmonella dublin* DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 2690 *Salmonella dublin* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 462 *Klebsiella pneumoniae* DIOL DEHYDRASE (DIOL DEHYDRATASE) GAMMA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_28 4596 *Klebsiella pneumoniae* DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_30 44 *Salmonella typhimurium* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 3932 *Salmonella typhimurium* pduC GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 1041 *Salmonella typhi* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 1800 *Salmonella typhi* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2910 *Salmonella paratyphi* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2911 *Salmonella paratyphi* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2914 *Salmonella paratyphi* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2915 *Salmonella paratyphi* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 320 *Salmonella enteritidis* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 405 *Salmonella enteritidis* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 3580 *Salmonella enteritidis* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2687 *Salmonella dublin* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2691 *Salmonella dublin* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2503 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2504 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 2505 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4593 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4594 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4595 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4597 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4598 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 4599 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_30 6395 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_30 6396 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)

4\_2\_1\_30 6397 *Klebsiella pneumoniae* GLYCEROL DEHYDRATASE (EC 4\_2\_1\_30)  
 4\_2\_1\_32 2959 *Salmonella typhimurium* ttdA L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2960 *Salmonella typhimurium* ttdB L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4138 *Salmonella typhimurium* L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_32 1862 *Salmonella typhi* L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 1863 *Salmonella typhi* L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4874 *Salmonella paratyphi* L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4875 *Salmonella paratyphi* L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2334 *Salmonella enteritidis* L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2335 *Salmonella enteritidis* L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 456 *Salmonella dublin* L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2660 *Salmonella dublin* L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2139 *Klebsiella pneumoniae* L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4489 *Klebsiella pneumoniae* L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4490 *Klebsiella pneumoniae* L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 4491 *Klebsiella pneumoniae* L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2984 *Escherichia coli* ttdA L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 2985 *Escherichia coli* ttdB L(+)-TARTRATE DEHYDRATASE BETA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_32 1230 *Clostridium difficile* EC-ttdA L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_32 1369 *Clostridium acetobutylicum* 3909760\_C1\_33 L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_32 7540 *Bordetella bronchiseptica* EC-ttdA L(+)-TARTRATE DEHYDRATASE (EC 4\_2\_1\_32)  
 4\_2\_1\_33 5771 *Yersinia pseudotuberculosis* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 5772 *Yersinia pseudotuberculosis* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4199 *Yersinia pestis* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4200 *Yersinia pestis* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 6249 *Vibrio cholerae* El Tor N16961 ORF03149 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 6250 *Vibrio cholerae* El Tor N16961 ORF03150 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 355 *Streptococcus pneumoniae* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1052 *Streptococcus mutans* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1053 *Streptococcus mutans* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1646 *Staphylococcus aureus* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2971 *Staphylococcus aureus* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 566 *Salmonella typhimurium* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3330 *Salmonella typhimurium* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 5387 *Salmonella typhimurium* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 997 *Salmonella typhi* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4744 *Salmonella typhi* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1776 *Salmonella paratyphi* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3569 *Salmonella paratyphi* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1689 *Salmonella enteritidis* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4396 *Salmonella enteritidis* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3706 *Salmonella dublin* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3707 *Salmonella dublin* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)

4\_2\_1\_33 8475 *Saccharomyces cerevisiae* LEU1 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 588 *Pseudomonas aeruginosa* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1644 *Pseudomonas aeruginosa* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1210 *Pasteurella multocida* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1211 *Pasteurella multocida* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 164 *Neisseria gonorrhoeae* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 166 *Neisseria gonorrhoeae* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3319 *Mycobacterium tuberculosis* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3320 *Mycobacterium tuberculosis* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3102 *Mycobacterium leprae* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3103 *Mycobacterium leprae*sp|O33124 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2748 *Mycobacterium bovis* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2749 *Mycobacterium bovis* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3815 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3816 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3817 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 3818 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4245 *Klebsiella pneumoniae* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2099 *Haemophilus influenzae* HI0988 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 9363 *Haemophilus influenzae* HI0989 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4318 *Escherichia coli* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4319 *Escherichia coli* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1924 *Corynebacterium diphtheriae* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1925 *Corynebacterium diphtheriae* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 548 *Clostridium difficile* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 549 *Clostridium difficile* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2235 *Clostridium acetobutylicum* 33225017\_C2\_26 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2236 *Clostridium acetobutylicum* 4814035\_C3\_29 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1066 *Campylobacter jejuni* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 1068 *Campylobacter jejuni* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 518 *Bordetella pertussis* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)

4\_2\_1\_33 2722 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2723 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2724 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4026 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4027 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4028 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 4687 *Bordetella pertussis* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 5660 *Bordetella bronchiseptica* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 7336 *Bordetella bronchiseptica* 3-ISOPROPYLMALATE DEHYDRATASE (EC 4\_2\_1\_33)  
 4\_2\_1\_33 7337 *Bordetella bronchiseptica* EC-leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 8113 *Bordetella bronchiseptica* 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 8114 *Bordetella bronchiseptica* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 8818 *Bordetella bronchiseptica* 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2819 *Bacillus subtilis* leuD 3-ISOPROPYLMALATE DEHYDRATASE SMALL SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_33 2820 *Bacillus subtilis* leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_40 2793 *Salmonella typhimurium* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 3711 *Salmonella typhimurium* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 1737 *Salmonella typhi* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 5306 *Salmonella typhi* PROBABLE GLUCARATE DEHYDRATASE 2 (EC 4\_2\_1\_40)  
 4\_2\_1\_40 2008 *Salmonella paratyphi* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 3412 *Salmonella enteritidis* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 3737 *Salmonella dublin* GLUCARATE DEHYDRATASE (EC 4\_2\_1\_40)  
 4\_2\_1\_40 1163 *Klebsiella pneumoniae* PROBABLE GLUCARATE DEHYDRATASE (EC 4\_2\_1\_40)  
 4\_2\_1\_40 1164 *Klebsiella pneumoniae* PROBABLE GLUCARATE DEHYDRATASE (EC 4\_2\_1\_40)  
 4\_2\_1\_40 2075 *Klebsiella pneumoniae* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 2076 *Klebsiella pneumoniae* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 2078 *Klebsiella pneumoniae* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 2079 *Klebsiella pneumoniae* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 5659 *Escherichia coli* b2787 GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_40 5660 *Escherichia coli* b2788 PROBABLE GLUCARATE DEHYDRATASE (EC 4\_2\_1\_40)  
 4\_2\_1\_40 250 *Bacillus subtilis* ycbF GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_41 247 *Bacillus subtilis* ycbC 5-DEHYDRO-4-DEOXYGLUCARATE DEHYDRATASE (EC 4\_2\_1\_41)  
 4\_2\_1\_42 4594 *Salmonella typhimurium* yhaG D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 1758 *Salmonella typhi* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 5794 *Salmonella paratyphi* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 2192 *Salmonella enteritidis* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 799 *Salmonella dublin* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 3116 *Klebsiella pneumoniae* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 3117 *Klebsiella pneumoniae* D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 3052 *Escherichia coli* yhaG D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_42 252 *Bacillus subtilis* ycbH D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_45 9 *Yersinia pseudotuberculosis* BS-yfnG CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 2641 *Yersinia pestis* BS-yfnG CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 6487 *Salmonella typhimurium* rfbG CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 627 *Salmonella typhi* CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 4897 *Salmonella paratyphi* CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 1374 *Salmonella enteritidis* CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_45 728 *Bacillus subtilis* yfnG CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_49 5599 *Yersinia pseudotuberculosis* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 2965 *Yersinia pestis* BS-hutU UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 5029 *Vibrio cholerae* El Tor N16961 ORF01563 UROCANATE HYDRATASE (EC 4\_2\_1\_49)



4\_2\_1\_49 1121 *Streptococcus pyogenes* hutU UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 3183 *Staphylococcus aureus* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 3272 *Staphylococcus aureus* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 1605 *Salmonella typhimurium* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 7062 *Salmonella typhimurium* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 3593 *Salmonella typhi* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 1883 *Salmonella paratyphi* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 1884 *Salmonella paratyphi* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 1885 *Salmonella paratyphi* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 2381 *Salmonella enteritidis* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 3647 *Salmonella dublin* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 7888 *Pseudomonas aeruginosa* hutU UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 637 *Porphyromonas gingivalis* BS-hutU UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 4381 *Klebsiella pneumoniae* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_49 3929 *Bacillus subtilis* hutU UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_51 6915 *Yersinia pseudotuberculosis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2830 *Yersinia pestis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 3649 *Yersinia pestis* PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 4563 *Vibrio cholerae* El Tor N16961 ORF00951 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 392 *Streptococcus pneumoniae* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 561 *Streptococcus mutans* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2031 *Staphylococcus aureus* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 3905 *Salmonella typhimurium* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 1837 *Salmonella typhi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 1601 *Salmonella paratyphi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 79 *Salmonella enteritidis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2614 *Saccharomyces cerevisiae* PHA2 PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 3027 *Pseudomonas aeruginosa* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 572 *Pasteurella multocida* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 1366 *Neisseria gonorrhoeae* sp|Q9ZHY3 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 307 *Mycobacterium tuberculosis* pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 1610 *Mycobacterium leprae* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 846 *Mycobacterium bovis* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 7342 *Klebsiella pneumoniae* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 5998 *Haemophilus influenzae* HI1145 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 281 *Haemophilus ducreyi* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2535 *Escherichia coli* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2257 *Enterococcus faecium* (DOE) PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2194 *Enterococcus faecalis* EC-pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2150 *Corynebacterium diphtheriae* PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2417 *Clostridium difficile* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 732 *Clostridium acetobutylicum* 16601575\_C1\_44 PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2276 *Campylobacter jejuni* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 195 *Bordetella pertussis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)

4\_2\_1\_51 2692 *Bordetella pertussis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2694 *Bordetella pertussis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 7356 *Bordetella bronchiseptica* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_51 2784 *Bacillus subtilis* pheA PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_52 5705 *Yersinia pseudotuberculosis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 281 *Yersinia pestis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 5944 *Vibrio cholerae* El Tor N16961 ORF02728 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1356 *Streptococcus pneumoniae* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1765 *Streptococcus mutans* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1398 *Staphylococcus aureus* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1737 *Salmonella typhimurium* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2684 *Salmonella typhimurium* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1296 *Salmonella typhi* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4037 *Salmonella paratyphi* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4038 *Salmonella paratyphi* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2837 *Salmonella enteritidis* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2559 *Salmonella dublin* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 420 *Rickettsia prowazekii* RP429 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4294 *Pseudomonas aeruginosa* PA0223 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 5773 *Pseudomonas aeruginosa* PA1254 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 7176 *Pseudomonas aeruginosa* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 7818 *Pseudomonas aeruginosa* PA4188 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1241 *Porphyromonas gingivalis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 645 *Pasteurella multocida* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 546 *Neisseria gonorrhoeae* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4893 *Mycobacterium tuberculosis* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 158 *Mycobacterium leprae* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2884 *Mycobacterium bovis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 3365 *Klebsiella pneumoniae* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 8541 *Klebsiella pneumoniae* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 419 *Helicobacter pylori* HP1013 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 412 *Helicobacter pylori* J99 dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4233 *Haemophilus influenzae* HI0255 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1034 *Haemophilus ducreyi* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 259 *Escherichia coli* yagE DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 5503 *Escherichia coli* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 6423 *Escherichia coli* yjH DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1725 *Enterococcus faecium* (DOE) DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2022 *Enterococcus faecalis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1110 *Corynebacterium diphtheriae* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1849 *Corynebacterium diphtheriae* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1032 *Clostridium difficile* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1034 *Clostridium difficile* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1072 *Clostridium difficile* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 2271 *Clostridium difficile* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 804 *Clostridium acetobutylicum* 25820327\_F3\_23 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 3322 *Clostridium acetobutylicum* 33450\_C1\_5 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 343 *Chlamydia trachomatis* D/UW-3/Cx EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 802 *Chlamydia pneumoniae* AR39 CP0802 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 972 *Chlamydia pneumoniae* CWL029 dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 425 *Campylobacter jejuni* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 580 *Campylobacter jejuni* Cj0481 DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 315 *Bordetella pertussis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 4273 *Bordetella pertussis* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 6595 *Bordetella bronchiseptica* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)

4\_2\_1\_52 7186 *Bordetella bronchiseptica* DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 7482 *Bordetella bronchiseptica* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_52 1677 *Bacillus subtilis* dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_55 3151 *Pseudomonas aeruginosa* PA2767 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 5498 *Pseudomonas aeruginosa* PA2890 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 6815 *Pseudomonas aeruginosa* PA0745 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 2691 *Mycobacterium tuberculosis* echA18 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 2807 *Mycobacterium tuberculosis* echA20 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 510 *Mycobacterium bovis* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 6320 *Klebsiella pneumoniae* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 6321 *Klebsiella pneumoniae* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 1353 *Escherichia coli* b1393 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 822 *Clostridium difficile* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 532 *Clostridium acetobutylicum* 32812\_C1\_69 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 146 *Bordetella pertussis* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 176 *Bordetella pertussis* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 6532 *Bordetella bronchiseptica* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 6859 *Bordetella bronchiseptica* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 7942 *Bordetella bronchiseptica* 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 1821 *Bacillus subtilis* yngF 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_55 2848 *Bacillus subtilis* ysiB 3-HYDROXYBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_6 5846 *Salmonella typhimurium* GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_6 110 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21) / GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_6 4107 *Salmonella enteritidis* GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_6 3832 *Salmonella dublin* GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_6 6545 *Escherichia coli* yidU 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21) / GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_60 151 *Yersinia pestis* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 3762 *Yersinia pestis* EC-fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 5295 *Vibrio cholerae* El Tor N16961 ORF01901 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 1624 *Salmonella typhimurium* fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 4141 *Salmonella typhi* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 5226 *Salmonella paratyphi* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 2035 *Salmonella enteritidis* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 3001 *Pseudomonas aeruginosa* fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 1496 *Pasteurella multocida* fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 5476 *Klebsiella pneumoniae* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 2804 *Haemophilus influenzae* HI1325 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 1367 *Haemophilus ducreyi* EC-fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_60 4700 *Escherichia coli* fabA 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_61 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3- HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61) ; ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9) ; [ACYL- CARRIER-PROTEIN]

ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER- PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14) ]  
 4\_2\_1\_61 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 1599 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 2377 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 2378 *Mycobacterium leprae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 2541 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 2542 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 3303 *Mycobacterium bovis* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_61 2484 *Corynebacterium diphtheriae* FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 4\_2\_1\_7 5291 *Yersinia pseudotuberculosis* EC-uxaA ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 3855 *Yersinia pestis* EC-uxaA ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4662 *Yersinia pestis* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 6395 *Salmonella typhimurium* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 6396 *Salmonella typhimurium* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 6397 *Salmonella typhimurium* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 915 *Salmonella typhi* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4831 *Salmonella typhi* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 3604 *Salmonella paratyphi* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 3605 *Salmonella paratyphi* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 5793 *Salmonella paratyphi* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 2804 *Salmonella enteritidis* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 5114 *Salmonella enteritidis* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4215 *Salmonella dublin* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4069 *Klebsiella pneumoniae* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4070 *Klebsiella pneumoniae* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4071 *Klebsiella pneumoniae* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4072 *Klebsiella pneumoniae* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 4073 *Klebsiella pneumoniae* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 5823 *Escherichia coli* uxaA ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 1910 *Enterococcus faecium* (DOE) EC-uxaA ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 1537 *Clostridium difficile* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 1538 *Clostridium difficile* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 2269 *Clostridium difficile* ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 1099 *Clostridium acetobutylicum* 34620885\_C1\_52 ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 576 *Campylobacter jejuni* uxaA' ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 579 *Campylobacter jejuni* uxaA' ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_7 1240 *Bacillus subtilis* yjmJ ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_8 4452 *Yersinia pseudotuberculosis* EC-uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 791 *Yersinia pestis* EC-uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 448 *Streptococcus equi* EC-uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 6664 *Salmonella typhimurium* uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 5342 *Salmonella typhi* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 5507 *Salmonella paratyphi* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 5508 *Salmonella paratyphi* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 1937 *Salmonella enteritidis* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 762 *Salmonella dublin* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 926 *Klebsiella pneumoniae* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 927 *Klebsiella pneumoniae* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 3839 *Klebsiella pneumoniae* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 3840 *Klebsiella pneumoniae* MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 122 *Haemophilus influenzae* HI0055 MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 4205 *Escherichia coli* uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 3135 *Enterococcus faecium* (DOE) MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)

4\_2\_1\_8 3519 *Enterococcus faecium* (DOE) MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 830 *Enterococcus faecalis* EC-uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 2081 *Clostridium acetobutylicum* 19535877\_F1\_4 MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_8 1235 *Bacillus subtilis* yjmE MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_84 560 *Mycobacterium tuberculosis* Rv0106 NITRILE HYDRATASE SUBUNIT BETA (EC 4\_2\_1\_84)  
 4\_2\_1\_84 2975 *Mycobacterium bovis* BS-yjcC NITRILE HYDRATASE SUBUNIT BETA (EC 4\_2\_1\_84)  
 4\_2\_1\_89 3943 *Salmonella typhimurium* caiB L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_89 3203 *Salmonella typhi* L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_89 2563 *Salmonella paratyphi* L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_89 2553 *Salmonella enteritidis* L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_89 4299 *Escherichia coli* caiB L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_9 8029 *Yersinia pseudotuberculosis* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3873 *Yersinia pestis* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3912 *Vibrio cholerae* El Tor N16961 ORF00055 DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 486 *Streptococcus pneumoniae* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1176 *Streptococcus mutans* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1641 *Staphylococcus aureus* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2086 *Salmonella typhimurium* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2682 *Salmonella typhimurium* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2256 *Salmonella typhi* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3931 *Salmonella paratyphi* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3311 *Salmonella enteritidis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 4150 *Salmonella enteritidis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2561 *Salmonella dublin* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3158 *Salmonella dublin* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1997 *Saccharomyces cerevisiae* ILV3 DIHYDROXY-ACID DEHYDRATASE, MITOCHONDRIAL PRECURSOR (EC 4\_2\_1\_9)  
 4\_2\_1\_9 5294 *Pseudomonas aeruginosa* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 687 *Pasteurella multocida* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 632 *Neisseria gonorrhoeae* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 5176 *Mycobacterium tuberculosis* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2902 *Mycobacterium leprae* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3351 *Mycobacterium leprae* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 576 *Mycobacterium bovis* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 577 *Mycobacterium bovis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 4959 *Klebsiella pneumoniae* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 4961 *Klebsiella pneumoniae* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 8890 *Haemophilus influenzae* HI0738 DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 260 *Escherichia coli* yagF DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3683 *Escherichia coli* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 6509 *Escherichia coli* yjgG DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 376 *Corynebacterium diphtheriae* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1089 *Clostridium difficile* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 808 *Clostridium acetobutylicum* 34178200\_F3\_25 DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 809 *Clostridium acetobutylicum* 42216\_F2\_14 DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2233 *Clostridium acetobutylicum* 5133562\_C3\_30 DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1116 *Campylobacter jejuni* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1729 *Bordetella pertussis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 1730 *Bordetella pertussis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2118 *Bordetella pertussis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2836 *Bordetella pertussis* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3077 *Bordetella pertussis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 3988 *Bordetella pertussis* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 5399 *Bordetella bronchiseptica* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 5435 *Bordetella bronchiseptica* DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_9 2185 *Bacillus subtilis* ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_90 5362 *Escherichia coli* b2247 L-rhamnonate dehydratase (EC 4\_2\_1\_90)  
 4\_2\_2\_1 959 *Streptococcus pyogenes* hylA HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_1 722 *Streptococcus pneumoniae* HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_1 1097 *Streptococcus equi* HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_1 136 *Staphylococcus aureus* sp[Q59801] HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_1 67 *Enterococcus faecalis* HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)

- 4\_2\_2\_1 1909 *Enterococcus faecalis* HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_10 1863 *Bacillus subtilis* pelB PECTIN LYASE (EC 4\_2\_2\_10)  
 4\_2\_2\_2 72 *Yersinia pseudotuberculosis* PERIPLASMIC PECTATE LYASE PRECURSOR (EC 4\_2\_2\_2)  
 4\_2\_2\_2 4214 *Yersinia pestis* PERIPLASMIC PECTATE LYASE PRECURSOR (EC 4\_2\_2\_2)  
 4\_2\_2\_2 1 *Clostridium acetobutylicum* 24642132\_F2\_25 pectate lyase (EC 4\_2\_2\_2) precursor - *Erwinia chrysanthemi*  
 4\_2\_2\_2 2612 *Clostridium acetobutylicum* 34275312\_C1\_10 PECTATE LYASE C (EC 4\_2\_2\_2)  
 4\_2\_2\_2 756 *Bacillus subtilis* pel PECTATE LYASE (EC 4\_2\_2\_2)  
 4\_2\_2\_2 3490 *Bacillus subtilis* yvpA PECTATE LYASE (EC 4\_2\_2\_2)  
 4\_2\_2\_3 1653 *Pseudomonas aeruginosa* algL ALGINATE LYASE PRECURSOR (EC 4\_2\_2\_3)  
 4\_2\_2\_3 8406 *Pseudomonas aeruginosa* PA1784 ALGINATE LYASE PRECURSOR (EC 4\_2\_2\_3)  
 4\_2\_2\_3 8559 *Pseudomonas aeruginosa* PA1167 ALGINATE LYASE PRECURSOR (EC 4\_2\_2\_3)  
 4\_2\_2\_6 3752 *Yersinia pestis* OLIGOGALACTURONATE LYASE (EC 4\_2\_2\_6)  
 4\_2\_2\_6 6161 *Klebsiella pneumoniae* OLIGOGALACTURONATE LYASE (EC 4\_2\_2\_6)  
 4\_2\_2\_9 7092 *Yersinia pseudotuberculosis* EXOPOLYGALACTURONATE LYASE (EC 4\_2\_2\_9)  
 4\_2\_2\_9 708 *Yersinia pestis* EXOPOLYGALACTURONATE LYASE (EC 4\_2\_2\_9)  
 4\_2\_2\_9 2666 *Enterococcus faecium* (DOE) EXOPOLYGALACTURONATE LYASE PRECURSOR (EC 4\_2\_2\_9)  
 4\_2\_99\_10 1236 *Streptococcus pneumoniae* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 974 *Streptococcus mutans* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 4079 *Saccharomyces cerevisiae* MET17 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 1621 *Pseudomonas aeruginosa* metY O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 659 *Pasteurella multocida* metC\_1 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 5138 *Mycobacterium tuberculosis* metC O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 1554 *Mycobacterium bovis* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 560 *Corynebacterium diphtheriae* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 2428 *Clostridium difficile* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 437 *Clostridium acetobutylicum* 36520263\_C1\_73 O-ACETYLHOMOSERINE (THIOL) -LYASE (EC 4\_2\_99\_10)  
 4\_2\_99\_10 455 *Clostridium acetobutylicum* 1368802\_C2\_86 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 1079 *Campylobacter jejuni* metY O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 3913 *Bordetella pertussis* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 83 *Bordetella bronchiseptica* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_10 9119 *Bordetella bronchiseptica* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_11 6467 *Yersinia pseudotuberculosis* EC-yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 7217 *Vibrio cholerae* El Tor N16961ORFA00406 METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 2906 *Salmonella typhimurium* mgsA METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 180 *Salmonella typhi* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 5868 *Salmonella paratyphi* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 1100 *Salmonella enteritidis* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 1409 *Pasteurella multocida* mgsA METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 5459 *Klebsiella pneumoniae* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 5460 *Klebsiella pneumoniae* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 9862 *Haemophilus influenzae* H11234 METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 4706 *Escherichia coli* yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 782 *Enterococcus faecium* (DOE) METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 2687 *Enterococcus faecalis* EC-yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 1983 *Clostridium difficile* EC-yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)

4\_2\_99\_11 2667 *Clostridium acetobutylicum* 20313802\_F1\_1 METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 385 *Borrelia burgdorferi* BB0364 METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 3442 *Bordetella pertussis* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 3935 *Bordetella pertussis* EC-yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 5900 *Bordetella bronchiseptica* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 6413 *Bordetella bronchiseptica* METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_11 2244 *Bacillus subtilis* ypfF METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_2 7399 *Yersinia pseudotuberculosis* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 2354 *Yersinia pestis* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 6129 *Vibrio cholerae* El Tor N16961 ORF02991 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 373 *Streptococcus pneumoniae* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1319 *Streptococcus mutans* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1634 *Streptococcus equi* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1315 *Staphylococcus aureus* BS-thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3758 *Salmonella typhimurium* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3637 *Salmonella typhi* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 227 *Salmonella paratyphi* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 228 *Salmonella paratyphi* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1369 *Salmonella paratyphi* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 2630 *Salmonella enteritidis* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3066 *Salmonella dublin* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3985 *Saccharomyces cerevisiae* THR4 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 4172 *Pseudomonas aeruginosa* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 470 *Pasteurella multocida* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 593 *Neisseria gonorrhoeae* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 910 *Mycobacterium tuberculosis* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1201 *Mycobacterium leprae* BS-thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1272 *Mycobacterium bovis* BS-thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3563 *Klebsiella pneumoniae* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3564 *Klebsiella pneumoniae* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1055 *Helicobacter pylori* HP0098 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 94 *Helicobacter pylori* J99sp/Q9ZMX5 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 18063 *Haemophilus influenzae* HI0087 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 4 *Escherichia coli* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 2512 *Enterococcus faecalis* BS-thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 689 *Corynebacterium diphtheriae* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 2149 *Clostridium difficile* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 1560 *Clostridium acetobutylicum* 24798260\_C3\_34 THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 415 *Campylobacter jejuni* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3119 *Bordetella pertussis* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 9012 *Bordetella bronchiseptica* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_2 3220 *Bacillus subtilis* thrC THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_8 5928 *Yersinia pseudotuberculosis* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5940 *Yersinia pseudotuberculosis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 6821 *Yersinia pseudotuberculosis* EC-cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 727 *Yersinia pestis* EC-cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 767 *Yersinia pestis* EC-cysK CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2966 *Yersinia pestis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4001 *Yersinia pestis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4400 *Vibrio cholerae* El Tor N16961 ORF00749 CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4801 *Vibrio cholerae* El Tor N16961 ORF01279 CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4887 *Vibrio cholerae* El Tor N16961 ORF01392 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1469 *Streptococcus pyogenes* cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 604 *Streptococcus pneumoniae* EC-cysM CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1236 *Streptococcus pneumoniae* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 901 *Streptococcus mutans* EC-cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 974 *Streptococcus mutans* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1387 *Streptococcus equi* EC-cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 821 *Staphylococcus aureus* BS-yrhA CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2342 *Staphylococcus aureus* EC-cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)



4\_2\_99\_8 3240 *Staphylococcus aureus* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 346 *Salmonella typhimurium* cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1547 *Salmonella typhimurium* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2765 *Salmonella typhimurium* cysK CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2446 *Salmonella typhi* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3789 *Salmonella typhi* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4212 *Salmonella typhi* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1432 *Salmonella paratyphi* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1433 *Salmonella paratyphi* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1978 *Salmonella paratyphi* CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1979 *Salmonella paratyphi* CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1980 *Salmonella paratyphi* CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4320 *Salmonella paratyphi* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3094 *Salmonella enteritidis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3447 *Salmonella enteritidis* CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2830 *Salmonella dublin* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4245 *Salmonella dublin* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4079 *Saccharomyces cerevisiae* MET17 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 8514 *Saccharomyces cerevisiae* YGR012W CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1621 *Pseudomonas aeruginosa* metY O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3748 *Pseudomonas aeruginosa* PA1061 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4758 *Pseudomonas aeruginosa* cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5996 *Pseudomonas aeruginosa* cysK CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 6214 *Pseudomonas aeruginosa* PA2104 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 659 *Pasteurella multocida* metC\_1 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 733 *Pasteurella multocida* cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1433 *Neisseria gonorrhoeae* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1995 *Neisseria gonorrhoeae* CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1339 *Mycobacterium tuberculosis* cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3027 *Mycobacterium tuberculosis* cysM3 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 4346 *Mycobacterium tuberculosis* Rv3684 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5138 *Mycobacterium tuberculosis* metC O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5673 *Mycobacterium tuberculosis* cysM PROBABLE CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1148 *Mycobacterium leprae*trQ49709 PROBABLE CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3817 *Mycobacterium leprae*sp|O32978 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 940 *Mycobacterium bovis* EC-cysM CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1554 *Mycobacterium bovis* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1572 *Mycobacterium bovis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1999 *Mycobacterium bovis* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3365 *Mycobacterium bovis* PROBABLE CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3562 *Mycobacterium bovis* EC-cysM CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3588 *Klebsiella pneumoniae* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3589 *Klebsiella pneumoniae* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3590 *Klebsiella pneumoniae* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5041 *Klebsiella pneumoniae* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1064 *Helicobacter pylori* HP0107 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 103 *Helicobacter pylori* J99tr|Q9ZMW6 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 5925 *Haemophilus influenzae* H1103 CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 301 *Haemophilus ducreyi* EC-cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2355 *Escherichia coli* cysK CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 6608 *Escherichia coli* cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 470 *Enterococcus faecium* (DOE) CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 655 *Enterococcus faecium* (DOE) CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1190 *Enterococcus faecalis* BS-yrhA CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2619 *Enterococcus faecalis* EC-cysM CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 318 *Corynebacterium diphtheriae* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)



4\_2\_99\_8 560 *Corynebacterium diphtheriae* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1241 *Clostridium difficile* EC-cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2305 *Clostridium difficile* CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2428 *Clostridium difficile* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 455 *Clostridium acetobutylicum* 1368802\_C2\_86 O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2238 *Clostridium acetobutylicum* 24662812\_C2\_36 CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3622 *Clostridium acetobutylicum* 36359625\_F2\_3 CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1079 *Campylobacter jejuni* metY O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 1316 *Campylobacter jejuni* cysM CYSTEINE SYNTHASE B (EC 4\_2\_99\_8)  
 4\_2\_99\_8 494 *Bordetella pertussis* EC-cysM CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 3913 *Bordetella pertussis* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 83 *Bordetella bronchiseptica* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 9119 *Bordetella bronchiseptica* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC 4\_2\_99\_10) / O-ACETYLSELINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 9195 *Bordetella bronchiseptica* EC-cysK CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_8 73 *Bacillus subtilis* cysK CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2719 *Bacillus subtilis* yrhA CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_8 2991 *Bacillus subtilis* ytkP CYSTEINE SYNTHASE (EC 4\_2\_99\_8)  
 4\_2\_99\_9 6531 *Yersinia pseudotuberculosis* EC-metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 372 *Yersinia pestis* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 5244 *Yersinia pestis* EC-metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 6431 *Vibrio cholerae* El Tor N16961 ORF03392 CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1273 *Streptococcus pneumoniae* BS-yjcl CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1222 *Staphylococcus aureus* BS-yjcl CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 3865 *Salmonella typhimurium* metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 5451 *Salmonella typhi* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 4365 *Salmonella paratyphi* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 4366 *Salmonella paratyphi* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 4367 *Salmonella paratyphi* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 2940 *Salmonella enteritidis* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 2413 *Saccharomyces cerevisiae* STR2 CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 6199 *Saccharomyces cerevisiae* YLL058W CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 6945 *Saccharomyces cerevisiae* YML082W CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 251 *Pasteurella multocida* metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 2895 *Mycobacterium tuberculosis* metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1383 *Mycobacterium leprae* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 2650 *Mycobacterium leprae* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1059 *Mycobacterium bovis* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1747 *Mycobacterium bovis* EC-metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 4262 *Klebsiella pneumoniae* CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 14471 *Haemophilus influenzae* HI0086 CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 3837 *Escherichia coli* metB CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 2239 *Clostridium acetobutylicum* 4096912\_C3\_41 CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_2\_99\_9 1188 *Bacillus subtilis* yjcl CYSTATHIONINE GAMMA-SYNTHASE (EC 4\_2\_99\_9)  
 4\_3\_1\_1 6333 *Yersinia pseudotuberculosis* EC-aspa ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 3990 *Yersinia pestis* EC-aspa ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 6446 *Vibrio cholerae* El Tor N16961 ORF03414 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 3052 *Salmonella typhimurium* aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1971 *Salmonella typhi* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 664 *Salmonella paratyphi* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1616 *Salmonella paratyphi* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1617 *Salmonella paratyphi* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 880 *Salmonella enteritidis* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 8072 *Pseudomonas aeruginosa* aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)

- 4\_3\_1\_1 1571 *Porphyromonas gingivalis* EC-aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1821 *Pasteurella multocida* aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 2040 *Neisseria gonorrhoeae* EC-aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1648 *Klebsiella pneumoniae* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 2098 *Klebsiella pneumoniae* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 83 *Helicobacter pylori* HP0649 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 594 *Helicobacter pylori* J99trjQ9ZLI5 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 17167 *Haemophilus influenzae* HI0534 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 188 *Haemophilus ducreyi* EC-aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 6354 *Escherichia coli* aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1087 *Corynebacterium diphtheriae* ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1484 *Clostridium acetobutylicum* 36135967\_F3\_36 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1485 *Clostridium acetobutylicum* 5117212\_F1\_9 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 1709 *Clostridium acetobutylicum* 48803\_C2\_31 ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 2735 *Campylobacter jejuni* aspA ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_1 2353 *Bacillus subtilis* ansB ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_12 7087 *Yersinia pseudotuberculosis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 1959 *Yersinia pestis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 4596 *Yersinia pestis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 1800 *Staphylococcus aureus* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 3355 *Pseudomonas aeruginosa* PA4908 ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 5986 *Pseudomonas aeruginosa* PA3862 ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 3416 *Enterococcus faecium* (DOE) ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 1365 *Enterococcus faecalis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 2263 *Enterococcus faecalis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 2165 *Clostridium difficile* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 4112 *Bordetella pertussis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_12 8920 *Bordetella bronchiseptica* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_15 7921 *Bordetella bronchiseptica* PUTATIVE DIAMINOPROPIONATE AMMONIA-LYASE (EC 4\_3\_1\_15)  
 4\_3\_1\_2 3034 *Bordetella pertussis* METHYLASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_2)  
 4\_3\_1\_2 6110 *Bordetella bronchiseptica* METHYLASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_2)  
 4\_3\_1\_5 6294 *Salmonella paratyphi* PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_5 1943 *Salmonella enteritidis* PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_5 1752 *Salmonella dublin* PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_5 311 *Escherichia coli* b0327 PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_5 5639 *Escherichia coli* b2760 PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_7 1085 *Salmonella typhimurium* eutC ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 2884 *Salmonella typhimurium* eutB ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 816 *Salmonella typhi* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 1125 *Salmonella typhi* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6 *Salmonella paratyphi* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 7 *Salmonella paratyphi* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 1604 *Salmonella paratyphi* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 1605 *Salmonella paratyphi* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 3350 *Salmonella enteritidis* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 5290 *Salmonella enteritidis* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 646 *Salmonella dublin* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 1128 *Pseudomonas aeruginosa* PA4025 ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 1129 *Pseudomonas aeruginosa* eutB ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6657 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6658 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6659 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6660 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6661 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 6662 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 8117 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 8118 *Klebsiella pneumoniae* ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)

4\_3\_1\_7 5480 *Escherichia coli* eutC ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 5481 *Escherichia coli* eutB ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 2448 *Enterococcus faecalis* EC-eutC ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 2449 *Enterococcus faecalis* EC-eutB ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 2079 *Clostridium difficile* EC-eutC ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 2080 *Clostridium difficile* EC-eutB ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 537 *Clostridium acetobutylicum* 4096905\_C1\_64 ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC 4\_3\_1\_7)  
 4\_3\_1\_7 538 *Clostridium acetobutylicum* 4064703\_C2\_78 ETHANOLAMINE AMMONIA-LYASE HEAVY CHAIN (EC 4\_3\_1\_7)  
 4\_3\_99\_1 2083 *Pseudomonas aeruginosa* cynS CYANATE LYASE (EC 4\_3\_99\_1)  
 4\_3\_99\_1 324 *Escherichia coli* cynS CYANATE LYASE (EC 4\_3\_99\_1)  
 4\_4\_1\_11 1209 *Porphyromonas gingivalis* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_11 5071 *Klebsiella pneumoniae* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_11 78 *Enterococcus faecalis* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_11 1705 *Enterococcus faecalis* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_11 1431 *Clostridium difficile* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_8 4224 *Yersinia pseudotuberculosis* EC-metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 4759 *Yersinia pseudotuberculosis* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2380 *Yersinia pestis* EC-metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 4984 *Yersinia pestis* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 5470 *Vibrio cholerae* El Tor N16961 ORF02139 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 899 *Streptococcus pyogenes* metB CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 3355 *Staphylococcus aureus* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 6635 *Salmonella typhimurium* metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 3703 *Salmonella typhi* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 5371 *Salmonella paratyphi* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 5372 *Salmonella paratyphi* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 124 *Salmonella enteritidis* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 3965 *Salmonella dublin* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2261 *Saccharomyces cerevisiae* YFR055W CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 3906 *Saccharomyces cerevisiae* STR3 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 1655 *Pasteurella multocida* metC\_2 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 734 *Mycobacterium bovis* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 883 *Klebsiella pneumoniae* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 6295 *Klebsiella pneumoniae* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 6296 *Klebsiella pneumoniae* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 14381 *Haemophilus influenzae* HI0122 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2930 *Escherichia coli* metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 3702 *Enterococcus faecium* (DOE) CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 300 *Clostridium acetobutylicum* 34109667\_C2\_86 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 302 *Clostridium acetobutylicum* 5276713\_C1\_71 CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 638 *Campylobacter jejuni* metC' CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2237 *Bordetella pertussis* EC-metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2913 *Bordetella pertussis* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 7683 *Bordetella bronchiseptica* EC-metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 9044 *Bordetella bronchiseptica* CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 1189 *Bacillus subtilis* yjcJ CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_4\_1\_8 2718 *Bacillus subtilis* yrhB CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_6\_1\_3 4442 *Yersinia pseudotuberculosis* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 553 *Yersinia pestis* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 6377 *Vibrio cholerae* El Tor N16961 ORF03324 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1077 *Streptococcus pyogenes* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 386 *Streptococcus pneumoniae* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1620 *Streptococcus mutans* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 444 *Streptococcus equi* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1172 *Staphylococcus aureus* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 301 *Salmonella typhimurium* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)

4\_6\_1\_3 39 *Salmonella typhi* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3147 *Salmonella paratyphi* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3149 *Salmonella paratyphi* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3150 *Salmonella paratyphi* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 609 *Salmonella enteritidis* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3746 *Pseudomonas aeruginosa* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 199 *Porphyromonas gingivalis* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 867 *Pasteurella multocida* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1380 *Neisseria gonorrhoeae* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3205 *Mycobacterium tuberculosis* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 2739 *Mycobacterium leprae* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 3332 *Mycobacterium bovis* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 6708 *Klebsiella pneumoniae* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1230 *Helicobacter pylori* HP0283 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 273 *Helicobacter pylori* J99sp|Q9ZMF2 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 463 *Haemophilus influenzae* HI0208 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 780 *Haemophilus ducreyi* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 5984 *Escherichia coli* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 2437 *Enterococcus faecium* (DOE) 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1360 *Enterococcus faecalis* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 745 *Corynebacterium diphtheriae* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 2420 *Clostridium difficile* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1752 *Clostridium acetobutylicum* 24899187\_F3\_11 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 351 *Chlamydia trachomatis* D/UW-3/Cx EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 816 *Chlamydia pneumoniae* AR39-CP0816 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 958 *Chlamydia pneumoniae* CWL029 EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 1783 *Campylobacter jejuni* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 4162 *Bordetella pertussis* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 8120 *Bordetella bronchiseptica* EC-aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_3 2266 *Bacillus subtilis* aroB 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_4 7968 *Yersinia pseudotuberculosis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 3993 *Yersinia pestis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 5909 *Vibrio cholerae* El Tor N16961 ORF02673 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 571 *Streptococcus pyogenes* aroF CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 387 *Streptococcus pneumoniae* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1619 *Streptococcus mutans* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1445 *Streptococcus equi* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 145 *Staphylococcus aureus* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1221 *Salmonella typhimurium* aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2321 *Salmonella typhi* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1651 *Salmonella paratyphi* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 928 *Salmonella enteritidis* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 722 *Salmonella dublin* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 5895 *Saccharomyces cerevisiae* ARO2 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 7489 *Pseudomonas aeruginosa* aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1318 *Porphyromonas gingivalis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 626 *Pasteurella multocida* aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 44 *Neurospora crassa* AAC49056\_1 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 448 *Neisseria gonorrhoeae* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 5876 *Mycobacterium tuberculosis* aroF CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 440 *Mycobacterium leprae* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1115 *Mycobacterium bovis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 7859 *Klebsiella pneumoniae* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 7860 *Klebsiella pneumoniae* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 7861 *Klebsiella pneumoniae* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 97 *Helicobacter pylori* HP0663 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 608 *Helicobacter pylori* J99sp|Q9ZLH1 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 4098 *Haemophilus influenzae* HI0196 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 604 *Haemophilus ducreyi* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 5421 *Escherichia coli* aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2434 *Enterococcus faecium* (DOE) CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1361 *Enterococcus faecalis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)

4\_6\_1\_4 2988 *Enterococcus faecalis* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 747 *Corynebacterium diphtheriae* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2418 *Clostridium difficile* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 1754 *Clostridium acetobutylicum* 20744838\_F3\_12 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 350 *Chlamydia trachomatis* D/UW-3/Cx EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 815 *Chlamydia pneumoniae* AR39 CP0815 CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 959 *Chlamydia pneumoniae* CWL029 EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 954 *Campylobacter jejuni* aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2766 *Bordetella pertussis* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2767 *Bordetella pertussis* CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 3272 *Bordetella pertussis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 6550 *Bordetella bronchiseptica* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 4\_6\_1\_4 2267 *Bacillus subtilis* aroF CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 5\_1\_1\_1 5426 *Yersinia pseudotuberculosis* BS-yncD ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1613 *Yersinia pestis* BS-yncD ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 2894 *Yersinia pestis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4247 *Vibrio cholerae* El Tor N16961 ORF00521 ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 5137 *Vibrio cholerae* El Tor N16961 ORF01699 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 553 *Treponema pallidum* TP0681 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 807 *Streptococcus pyogenes* alr ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 968 *Streptococcus pneumoniae* trjQ9S3V7 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1255 *Streptococcus mutans* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1917 *Streptococcus equi* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 803 *Staphylococcus aureus* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 3160 *Staphylococcus aureus* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 289 *Salmonella typhimurium* alr ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 353 *Salmonella typhimurium* alnB ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 836 *Salmonella typhi* ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4309 *Salmonella typhi* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 5450 *Salmonella typhi* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 2480 *Salmonella paratyphi* ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4201 *Salmonella paratyphi* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4202 *Salmonella paratyphi* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4531 *Salmonella paratyphi* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4532 *Salmonella paratyphi* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1049 *Salmonella enteritidis* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 2481 *Salmonella enteritidis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 4057 *Salmonella enteritidis* ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 93 *Rickettsia prowazekii* RP095 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 7389 *Pseudomonas aeruginosa* dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 8622 *Pseudomonas aeruginosa* alr ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1503 *Porphyromonas gingivalis* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1429 *Pasteurella multocida* alr ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 227 *Neisseria gonorrhoeae* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1315 *Mycobacterium tuberculosis* alr ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 2113 *Mycobacterium leprae* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1378 *Mycobacterium bovis* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 944 *Klebsiella pneumoniae* ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 8459 *Klebsiella pneumoniae* ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1636 *Helicobacter pylori* HP0941 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 873 *Helicobacter pylori* J99sp|Q9ZKQ9 ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 6843 *Haemophilus influenzae* H11575 ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 239 *Haemophilus ducreyi* EC-dadX ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1152 *Escherichia coli* dadX ALANINE RACEMASE, CATABOLIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 3939 *Escherichia coli* alr ALANINE RACEMASE, BIOSYNTHETIC (EC 5\_1\_1\_1)  
 5\_1\_1\_1 620 *Enterococcus faecium* (DOE) ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 87 *Enterococcus faecalis* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 427 *Corynebacterium diphtheriae* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1906 *Clostridium difficile* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 227 *Clostridium acetobutylicum* 19695375\_C3\_125 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1291 *Clostridium acetobutylicum* 4094558\_C2\_32 ALANINE RACEMASE (EC 5\_1\_1\_1)

5\_1\_1\_1 1309 *Campylobacter jejuni* alr ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 579 *Borrelia burgdorferi* BB0160 ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 293 *Bordetella pertussis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1739 *Bordetella pertussis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 2134 *Bordetella pertussis* EC-dadX ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 3639 *Bordetella pertussis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 3718 *Bordetella pertussis* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 6128 *Bordetella bronchiseptica* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 7255 *Bordetella bronchiseptica* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 8867 *Bordetella bronchiseptica* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 9171 *Bordetella bronchiseptica* ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 464 *Bacillus subtilis* dal ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_1 1764 *Bacillus subtilis* yncD ALANINE RACEMASE (EC 5\_1\_1\_1)  
 5\_1\_1\_13 6593 *Yersinia pseudotuberculosis* EC-ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 4125 *Yersinia pestis* EC-ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 1691 *Streptococcus mutans* EC-ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 5023 *Salmonella typhimurium* ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 2349 *Salmonella typhi* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 819 *Salmonella paratyphi* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 5124 *Salmonella paratyphi* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 2710 *Salmonella enteritidis* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 3715 *Salmonella enteritidis* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 3057 *Salmonella dublin* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 8018 *Klebsiella pneumoniae* ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 5690 *Escherichia coli* ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 678 *Enterococcus faecium* (DOE) BS-racX ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 660 *Clostridium difficile* EC-ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 1224 *Campylobacter jejuni* Cj0085c ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_13 3438 *Bacillus subtilis* racX ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_3 7651 *Yersinia pseudotuberculosis* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 4041 *Vibrio cholerae* El Tor N16961 ORF00222 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 131 *Treponema pallidum* TP0406 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1264 *Streptococcus pyogenes* glr GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 158 *Streptococcus pneumoniae* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1036 *Streptococcus equi* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2742 *Staphylococcus aureus* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2841 *Salmonella typhimurium* murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2842 *Salmonella typhimurium* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 5444 *Salmonella typhi* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 6224 *Salmonella paratyphi* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1590 *Salmonella dublin* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1905 *Pseudomonas aeruginosa* murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1741 *Porphyromonas gingivalis* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1722 *Pasteurella multocida* murI PROBABLE GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1376 *Neisseria gonorrhoeae* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 4 *Mycobacterium tuberculosis* murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1145 *Mycobacterium leprae* spP46705 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 3367 *Mycobacterium bovis* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 6403 *Klebsiella pneumoniae* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1463 *Helicobacter pylori* HP0549 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 500 *Helicobacter pylori* J99spJQ9ZLT0 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 14629 *Haemophilus influenzae* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 3865 *Escherichia coli* murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1465 *Enterococcus faecium* (DOE) GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2170 *Enterococcus faecalis* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1911 *Corynebacterium diphtheriae* GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 1447 *Clostridium difficile* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 159 *Clostridium acetobutylicum* 33598802\_C3\_176 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 986 *Campylobacter jejuni* murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 633 *Borrelia burgdorferi* BB0100 GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2673 *Bacillus subtilis* yrpC GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_3 2833 *Bacillus subtilis* racE GLUTAMATE RACEMASE (EC 5\_1\_1\_3)

5\_1\_1\_4 352 *Pseudomonas aeruginosa* PA1268 PROLINE RACEMASE (EC 5\_1\_1\_4)  
 5\_1\_1\_4 2134 *Pseudomonas aeruginosa* PA1255 PROLINE RACEMASE (EC 5\_1\_1\_4)  
 5\_1\_1\_4 2809 *Clostridium difficile* PROLINE RACEMASE (EC 5\_1\_1\_4)  
 5\_1\_1\_7 7986 *Yersinia pseudotuberculosis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2339 *Yersinia pestis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 4010 *Vibrio cholerae* El Tor N16961 ORF00181 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 5803 *Salmonella typhimurium* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 4204 *Salmonella typhi* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 3368 *Salmonella paratyphi* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 4249 *Salmonella enteritidis* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1506 *Salmonella dublin* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 406 *Rickettsia prowazekii* RP415 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2459 *Pseudomonas aeruginosa* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1072 *Pasteurella multocida* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1435 *Neisseria gonorrhoeae* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 3903 *Mycobacterium tuberculosis* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 831 *Mycobacterium leprae* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2079 *Mycobacterium leprae* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2937 *Mycobacterium bovis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 5673 *Klebsiella pneumoniae* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 5674 *Klebsiella pneumoniae* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2 *Helicobacter pylori* HP0566 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 515 *Helicobacter pylori* J99spjQ9ZLR5 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 8923 *Haemophilus influenzae* HI0750 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1132 *Haemophilus ducreyi* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 3715 *Escherichia coli* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1728 *Enterococcus faecium* (DOE) DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1104 *Enterococcus faecalis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1641 *Corynebacterium diphtheriae* DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 151 *Clostridium difficile* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 3401 *Clostridium acetobutylicum* 24271950\_C2\_12 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 412 *Chlamydia trachomatis* D/UW-3/Cx EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 234 *Chlamydia pneumoniae* AR39 CP0234 DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 471 *Chlamydia pneumoniae* CWL029 EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 2002 *Campylobacter jejuni* dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 1117 *Bordetella pertussis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 8578 *Bordetella bronchiseptica* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_1\_7 3212 *Bacillus subtilis* yutL DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_2\_2 5250 *Salmonella typhimurium* yfaW MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 5946 *Salmonella typhimurium* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 2063 *Salmonella typhi* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 3955 *Salmonella typhi* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 4182 *Salmonella paratyphi* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 5307 *Salmonella paratyphi* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 1552 *Salmonella enteritidis* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 3488 *Salmonella enteritidis* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 462 *Salmonella dublin* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 3350 *Pseudomonas aeruginosa* PA2215 MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 2690 *Klebsiella pneumoniae* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 2691 *Klebsiella pneumoniae* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 2839 *Klebsiella pneumoniae* MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 2429 *Bordetella pertussis* BS-ytfD MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 5822 *Bordetella bronchiseptica* BS-ytfD MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 8292 *Bordetella bronchiseptica* BS-yitF MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_2 1097 *Bacillus subtilis* yitF MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_3 6205 *Yersinia pseudotuberculosis* EC-fadB FATTY OXIDATION COMPLEX ALPHA SUBUNIT  
 [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA  
 ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-  
 HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]  
 5\_1\_2\_3 1798 *Yersinia pestis* EC-fadB FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES:  
 ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE



(EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 5037 *Yersinia pestis* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 6502 *Vibrio cholerae* El Tor N16961 ORF00007 FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 3736 *Salmonella typhimurium* oldB FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 6094 *Salmonella typhimurium* yfcX FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 2836 *Salmonella typhi* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 5398 *Salmonella typhi* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 2792 *Salmonella paratyphi* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 2793 *Salmonella paratyphi* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 2353 *Salmonella enteritidis* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 3560 *Salmonella enteritidis* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 4405 *Salmonella enteritidis* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 2360 *Pseudomonas aeruginosa* PA1737 FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 6348 *Pseudomonas aeruginosa* faoA FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 4295 *Mycobacterium tuberculosis* fadB FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 3177 *Mycobacterium leprae* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERAS (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]



5\_1\_2\_3 928 *Mycobacterium bovis* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 5004 *Klebsiella pneumoniae* FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 5432 *Escherichia coli* b2341 FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 6215 *Escherichia coli* fadB FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_2\_3 3278 *Bacillus subtilis* yusL FATTY OXIDATION COMPLEX ALPHA SUBUNIT [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]

5\_1\_3\_13 1391 *Streptococcus pyogenes* cpsFP DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 1187 *Streptococcus mutans* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 176 *Streptococcus equi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 367 *Streptococcus equi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 6490 *Salmonella typhimurium* rmlC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 904 *Salmonella typhi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 4893 *Salmonella paratyphi* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 889 *Salmonella enteritidis* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 3293 *Salmonella dublin* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 1468 *Pseudomonas aeruginosa* rmlC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 3267 *Pseudomonas aeruginosa* PA4069 DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 1383 *Porphyromonas gingivalis* EC-rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 1967 *Porphyromonas gingivalis* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 704 *Neisseria gonorrhoeae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 2952 *Mycobacterium tuberculosis* rmlC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 3518 *Mycobacterium leprae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 742 *Mycobacterium bovis* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 1661 *Klebsiella pneumoniae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 4831 *Klebsiella pneumoniae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 5233 *Escherichia coli* rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 3490 *Enterococcus faecium* (DOE) DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 513 *Enterococcus faecalis* EC-rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 392 *Corynebacterium diphtheriae* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 2505 *Clostridium acetobutylicum* 1367952\_C3\_18 DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) / DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)

5\_1\_3\_13 699 *Campylobacter jejuni* Cj1430c DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 3569 *Bordetella pertussis* EC-rfbC DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 7038 *Bordetella bronchiseptica* DTDP-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13)

5\_1\_3\_13 7039 *Bordetella bronchiseptica* DTD-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) /  
 DTD-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 5\_1\_3\_13 3775 *Bacillus subtilis* spsK DTD-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC 5\_1\_3\_13) /  
 DTD-4-DEHYDRORHAMNOSE REDUCTASE (EC 1\_1\_1\_133)  
 5\_1\_3\_20 7704 *Yersinia pseudotuberculosis* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE  
 (EC 5\_1\_3\_20)  
 5\_1\_3\_20 2110 *Yersinia pestis* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 598 *Vibrio cholerae* El Tor N16961 ORF00337 ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-  
 EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 375 *Salmonella typhimurium* rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 1922 *Salmonella typhi* ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 5897 *Salmonella paratyphi* ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 504 *Salmonella enteritidis* ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 1158 *Salmonella dublin* ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 6987 *Pseudomonas aeruginosa* rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 457 *Pasteurella multocida* rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 767 *Neisseria gonorrhoeae* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 522 *Klebsiella pneumoniae* ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 279 *Helicobacter pylori* HP0859 ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 792 *Helicobacter pylori* J99tr|Q9ZKY9 ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 12284 *Haemophilus influenzae* HI1114 ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 1253 *Haemophilus ducreyi* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 3539 *Escherichia coli* rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_20 1542 *Campylobacter jejuni* waaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 2860 *Bordetella pertussis* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE (EC  
 5\_1\_3\_20)  
 5\_1\_3\_20 7575 *Bordetella bronchiseptica* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-EPIMERASE  
 (EC 5\_1\_3\_20)  
 5\_1\_3\_4 6515 *Yersinia pseudotuberculosis* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 944 *Yersinia pestis* r|Q9X6B7 L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1604 *Yersinia pestis* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 892 *Streptococcus pyogenes* araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1047 *Streptococcus pneumoniae* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1295 *Streptococcus equi* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 2751 *Salmonella typhimurium* sgbE L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 2887 *Salmonella typhimurium* araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1895 *Salmonella typhi* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1478 *Salmonella paratyphi* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 3346 *Salmonella enteritidis* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 4254 *Salmonella dublin* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 888 *Pasteurella multocida* araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 346 *Mycoplasma pneumoniae* MP344 L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 4154 *Klebsiella pneumoniae* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 6472 *Klebsiella pneumoniae* L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 16100 *Haemophilus influenzae* HI1025 L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 397 *Haemophilus ducreyi* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 3503 *Escherichia coli* yiaS L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 4311 *Escherichia coli* araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 1085 *Enterococcus faecium* (DOE) L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 3169 *Enterococcus faecium* (DOE) L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 2180 *Enterococcus faecalis* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)  
 5\_1\_3\_4 2872 *Bacillus subtilis* araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC 5\_1\_3\_4)

5\_1\_3\_6 4833 *Klebsiella pneumoniae* UDP-GLUCURONATE 4-EPIMERASE (EC 5\_1\_3\_6)  
 5\_1\_3\_6 3480 *Enterococcus faecium* (DOE) UDP-GLUCURONATE 4-EPIMERASE (EC 5\_1\_3\_6)  
 5\_1\_3\_6 307 *Borrelia burgdorferi* BB0444 UDP-GLUCURONATE 4-EPIMERASE (EC 5\_1\_3\_6)  
 5\_1\_3\_6 3081 *Bacillus subtilis* ytcB UDP-GLUCURONATE 4-EPIMERASE (EC 5\_1\_3\_6)  
 5\_1\_3\_9 4177 *Yersinia pseudotuberculosis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 4352 *Yersinia pestis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 5578 *Vibrio cholerae* El Tor N16961 ORF02262 N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1790 *Streptococcus pyogenes* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 426 *Streptococcus pneumoniae* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 980 *Streptococcus pneumoniae* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1661 *Streptococcus equi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1844 *Staphylococcus aureus* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 2816 *Salmonella typhimurium* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 6109 *Salmonella typhimurium* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1169 *Salmonella typhi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1170 *Salmonella typhi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 4925 *Salmonella typhi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 2838 *Salmonella paratyphi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 2839 *Salmonella paratyphi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 5265 *Salmonella paratyphi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 5266 *Salmonella paratyphi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 4097 *Salmonella enteritidis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 819 *Salmonella dublin* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1080 *Pasteurella multocida* rjQ9L6B4 N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 6110 *Klebsiella pneumoniae* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 14337 *Haemophilus influenzae* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 17946 *Haemophilus influenzae* HI0145 N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 407 *Haemophilus ducreyi* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 5885 *Escherichia coli* b3223 N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 2884 *Enterococcus faecium* (DOE) N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 3764 *Enterococcus faecium* (DOE) N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 592 *Enterococcus faecalis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 735 *Enterococcus faecalis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 1842 *Corynebacterium diphtheriae* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 3724 *Clostridium difficile* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_1\_3\_9 116 *Borrelia burgdorferi* BB0644 N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_2\_1\_1 165 *Bordetella pertussis* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_1 258 *Bordetella pertussis* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_1 1765 *Bordetella pertussis* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_1 9076 *Bordetella bronchiseptica* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_1 9187 *Bordetella bronchiseptica* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_4 5172 *Vibrio cholerae* El Tor N16961 ORF01738 MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 4075 *Salmonella typhimurium* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 750 *Salmonella typhi* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 1958 *Salmonella paratyphi* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 3460 *Salmonella enteritidis* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 701 *Pseudomonas aeruginosa* PA2473 MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 3468 *Bordetella pertussis* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_2\_1\_4 7308 *Bordetella bronchiseptica* MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_3\_1\_12 7695 *Yersinia pseudotuberculosis* EC-uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 4267 *Yersinia pestis* EC-uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 447 *Streptococcus equi* EC-uxaC URONATE ISOMERASE (EC 5\_3\_1\_12) 5\_3\_1\_12 6660 *Salmonella typhimurium* uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 3396 *Salmonella typhi* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 5500 *Salmonella paratyphi* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 5501 *Salmonella paratyphi* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 5502 *Salmonella paratyphi* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 3904 *Salmonella enteritidis* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 4492 *Salmonella dublin* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 4066 *Klebsiella pneumoniae* URONATE ISOMERASE (EC 5\_3\_1\_12)

5\_3\_1\_12 4067 *Klebsiella pneumoniae* URONATE ISOMERASE (EC 5\_3\_1\_12) 5\_3\_1\_12 4068 *Klebsiella pneumoniae* URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 5824 *Escherichia coli* uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 3395 *Enterococcus faecium* (DOE) EC-uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 1104 *Clostridium acetobutylicum* 7207516\_C1\_50 URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 3993 *Clostridium acetobutylicum* 3953138\_C2\_3 URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_12 1231 *Bacillus subtilis* yjmA URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_14 7797 *Yersinia pseudotuberculosis* EC-rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 411 *Yersinia pestis* EC-rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 788 *Salmonella typhimurium* rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 3301 *Salmonella typhi* L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 411 *Salmonella paratyphi* L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 723 *Salmonella enteritidis* L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 2236 *Salmonella dublin* L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 2538 *Klebsiella pneumoniae* L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 6241 *Escherichia coli* rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 3541 *Enterococcus faecium* (DOE) L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 1296 *Enterococcus faecalis* EC-rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_14 3112 *Bacillus subtilis* yule L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_16 6123 *Yersinia pseudotuberculosis* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2946 *Yersinia pestis* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 4963 *Vibrio cholerae* El Tor N16961 ORF01482 PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1154 *Streptococcus mutans* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1913 *Staphylococcus aureus* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2251 *Salmonella typhimurium* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1639 *Salmonella typhi* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 6193 *Salmonella paratyphi* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 6194 *Salmonella paratyphi* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2828 *Salmonella enteritidis* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2326 *Salmonella dublin* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 6310 *Saccharomyces cerevisiae* HIS6 PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 5365 *Pseudomonas aeruginosa* PA5055 PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 7005 *Pseudomonas aeruginosa* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1895 *Pasteurella multocida* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 118 *Neisseria gonorrhoeae* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 934 *Neisseria gonorrhoeae* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2632 *Mycobacterium tuberculosis* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2963 *Mycobacterium leprae* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2259 *Mycobacterium bovis* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 3960 *Klebsiella pneumoniae* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)

5\_3\_1\_16 4642 *Haemophilus influenzae* HI0473 PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1972 *Escherichia coli* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1807 *Corynebacterium diphtheriae* PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 1147 *Clostridium difficile* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 2126 *Clostridium acetobutylicum* 5110885\_C3\_41 PHOSPHORIBOSYLFORMIMINO-5-  
 AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 900 *Campylobacter jejuni* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 765 *Bordetella pertussis* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 7811 *Bordetella bronchiseptica* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_16 3483 *Bacillus subtilis* hisA PHOSPHORIBOSYLFORMIMINO-5-AMINOIMIDAZOLE  
 CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_17 4840 *Yersinia pestis* EC-kdul 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-  
 ISOMERASE (EC 5\_3\_1\_17)  
 5\_3\_1\_17 5027 *Salmonella typhimurium* kdul 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-  
 ISOMERASE (EC 5\_3\_1\_17)  
 5\_3\_1\_17 224 *Salmonella typhi* 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE (EC  
 5\_3\_1\_17)  
 5\_3\_1\_17 5127 *Salmonella paratyphi* 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_17 2705 *Salmonella enteritidis* 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_17 5693 *Escherichia coli* kdul 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_17 2265 *Enterococcus faecium* (DOE) 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-  
 ISOMERASE (EC 5\_3\_1\_17)  
 5\_3\_1\_17 395 *Enterococcus faecalis* 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_17 1304 *Enterococcus faecalis* 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_17 2210 *Bacillus subtilis* kdul 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-ISOMERASE  
 (EC 5\_3\_1\_17)  
 5\_3\_1\_22 7681 *Yersinia pseudotuberculosis* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3450 *Yersinia pestis* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3730 *Salmonella typhimurium* ygbM HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 6604 *Salmonella typhimurium* gip HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 1395 *Salmonella typhi* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3719 *Salmonella typhi* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3828 *Salmonella paratyphi* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 5607 *Salmonella paratyphi* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 2208 *Salmonella enteritidis* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3004 *Salmonella enteritidis* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 3824 *Salmonella dublin* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 2836 *Pseudomonas aeruginosa* PA1501 HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 8636 *Pseudomonas aeruginosa* PA0550 HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 334 *Pasteurella multocida* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 6984 *Klebsiella pneumoniae* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 2154 *Haemophilus influenzae* HI1013 HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 491 *Escherichia coli* gip HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 2668 *Escherichia coli* b2739 HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_22 5109 *Bordetella bronchiseptica* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_24 6735 *Yersinia pseudotuberculosis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC  
 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2569 *Yersinia pestis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-  
 (5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)

5\_3\_1\_24 1507 *Streptococcus pneumoniae* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 803 *Streptococcus mutans* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 804 *Streptococcus mutans* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 3404 *Staphylococcus aureus* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 861 *Salmonella typhimurium* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 393 *Salmonella typhi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2877 *Salmonella paratyphi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2878 *Salmonella paratyphi* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 5680 *Pseudomonas aeruginosa* trpF N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 1537 *Pasteurella multocida* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 1697 *Neisseria gonorrhoeae* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2306 *Klebsiella pneumoniae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 7322 *Klebsiella pneumoniae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 673 *Helicobacter pylori* HP1279 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 1189 *Helicobacter pylori* J99sp|Q9ZJU8 INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 6522 *Haemophilus influenzae* sp|P46451|TRPC\_HAEIN INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 4843 *Escherichia coli* trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2135 *Corynebacterium diphtheriae* INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2032 *Clostridium acetobutylicum* 34011567\_F3\_9 N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 312 *Chlamydia trachomatis* D/UW-3/Cx trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2329 *Campylobacter jejuni* trpF N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 3318 *Bordetella pertussis* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 6789 *Bordetella bronchiseptica* EC-trpC N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 1756 *Bacillus subtilis* ynaI N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_24 2261 *Bacillus subtilis* trpF N-(5'-PHOSPHORIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_25 1535 *Streptococcus pneumoniae* EC-fucI L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 5535 *Salmonella typhimurium* fucI L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 3853 *Salmonella typhi* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 6000 *Salmonella paratyphi* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 6001 *Salmonella paratyphi* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 3945 *Salmonella enteritidis* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 1864 *Salmonella dublin* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 4050 *Klebsiella pneumoniae* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 4051 *Klebsiella pneumoniae* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 4052 *Klebsiella pneumoniae* L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 20632 *Haemophilus influenzae* HI0614 L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_25 2733 *Escherichia coli* fucI L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)

5\_3\_1\_26 974 *Yersinia pestis* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 423 *Streptococcus pyogenes* lacB\_1 GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 444 *Streptococcus pyogenes* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 608 *Streptococcus pyogenes* lacA\_2 GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 609 *Streptococcus pyogenes* lacB\_2 GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 726 *Streptococcus pneumoniae* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1826 *Streptococcus pneumoniae* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 102 *Streptococcus mutans* P26423 GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 103 *Streptococcus mutans* EC-rpiB GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1355 *Streptococcus mutans* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 543 *Streptococcus equi* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 544 *Streptococcus equi* GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1098 *Streptococcus equi* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 2821 *Staphylococcus aureus* P26592 GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 3723 *Staphylococcus aureus* GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 2808 *Salmonella typhimurium* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 4695 *Salmonella enteritidis* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1693 *Salmonella dublin* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 3358 *Klebsiella pneumoniae* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 244 *Enterococcus faecalis* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 245 *Enterococcus faecalis* GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1920 *Clostridium acetobutylicum* 6698591\_C2\_34 GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 1921 *Clostridium acetobutylicum* 273385\_C1\_29 GALACTOSE-6-PHOSPHATE ISOMERASE LACA SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_26 4162 *Clostridium acetobutylicum* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC 5\_3\_1\_26)  
 5\_3\_1\_4 7514 *Yersinia pseudotuberculosis* EC-araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 987 *Yersinia pestis* EC-araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 295 *Salmonella typhimurium* araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 1894 *Salmonella typhi* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 279 *Salmonella paratyphi* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 280 *Salmonella paratyphi* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 281 *Salmonella paratyphi* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3347 *Salmonella enteritidis* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 4253 *Salmonella dublin* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3788 *Klebsiella pneumoniae* L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 4312 *Escherichia coli* araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3167 *Enterococcus faecium* (DOE) EC-araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 1775 *Clostridium acetobutylicum* 23647187\_F3\_8 L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3258 *Clostridium acetobutylicum* 4745217\_C2\_6 L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3259 *Clostridium acetobutylicum* 20751282\_C1\_4 L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 3964 *Clostridium acetobutylicum* 30195337\_F2\_1 L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_4 2874 *Bacillus subtilis* araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)



5\_3\_1\_5 6147 *Yersinia pseudotuberculosis* EC-xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 2472 *Yersinia pestis* EC-xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 3150 *Salmonella typhimurium* xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 649 *Salmonella typhi* XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 4512 *Salmonella paratyphi* XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 4513 *Salmonella paratyphi* XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 809 *Salmonella dublin* XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 7393 *Klebsiella pneumoniae* XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 5941 *Haemophilus influenzae* HII112 XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 6084 *Escherichia coli* xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 1968 *Enterococcus faecalis* EC-xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 190 *Clostridium difficile* EC-xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_1\_5 1760 *Bacillus subtilis* xylA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_3\_10 3943 *Yersinia pestis* 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 4948 *Salmonella typhimurium* hpcD 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 1288 *Salmonella typhi* 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 1137 *Salmonella paratyphi* 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 496 *Pseudomonas aeruginosa* hpcD 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 6151 *Pseudomonas aeruginosa* PA1966 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 931 *Pasteurella multocida* hpaF 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_10 1143 *Klebsiella pneumoniae* 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_4 311 *Pseudomonas aeruginosa* catC MUCONOLACTONE ISOMERASE (EC 5\_3\_3\_4)  
 5\_4\_1\_2 969 *Salmonella typhimurium* cbiC PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 2988 *Salmonella typhi* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 1998 *Salmonella paratyphi* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 2863 *Salmonella enteritidis* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 1515 *Salmonella dublin* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 5844 *Pseudomonas aeruginosa* cobH PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 1219 *Mycobacterium tuberculosis* cobH PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 8951 *Klebsiella pneumoniae* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 1525 *Corynebacterium diphtheriae* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_1\_2 926 *Clostridium difficile* PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_2\_3 5499 *Yersinia pseudotuberculosis* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 816 *Yersinia pestis* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 4498 *Vibrio cholerae* El Tor N16961 ORF00868 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 434 *Streptococcus pyogenes* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1191 *Streptococcus pneumoniae* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1192 *Streptococcus pneumoniae* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1666 *Streptococcus mutans* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 755 *Streptococcus equi* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 309 *Staphylococcus aureus* strP95685 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 3580 *Salmonella typhimurium* mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 6855 *Salmonella typhimurium* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-)/ PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)



5\_4\_2\_3 5363 *Salmonella typhi* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 497 *Salmonella paratyphi* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2824 *Saccharomyces cerevisiae* PCMI PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3)  
 5\_4\_2\_3 4535 *Pseudomonas aeruginosa* glmM PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1455 *Pasteurella multocida* mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 800 *Neisseria gonorrhoeae* BS-yhxB PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2923 *Mycobacterium tuberculosis* mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1244 *Mycobacterium leprae* trQ49869 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2064 *Mycobacterium bovis* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1034 *Helicobacter pylori* HP0075 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 71 *Helicobacter pylori* J99trQ9ZM22 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 10078 *Haemophilus influenzae* HI1337 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 15164 *Haemophilus influenzae* HI1463 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 1384 *Haemophilus ducreyi* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 5862 *Escherichia coli* mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 3435 *Enterococcus faecium* (DOE) EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2526 *Enterococcus faecalis* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 3560 *Clostridium difficile* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 233 *Clostridium acetobutylicum* 5346062\_C2\_109 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 779 *Chlamydia trachomatis* D/UW-3/Cx mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 893 *Chlamydia pneumoniae* AR39 CP0893 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 893 *Chlamydia pneumoniae* CWL029 pgm PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2342 *Campylobacter jejuni* Cj0360 PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 2677 *Bordetella pertussis* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 6545 *Bordetella bronchiseptica* PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_3 177 *Bacillus subtilis* ybbT PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)  
 5\_4\_2\_6 963 *Neisseria gonorrhoeae* BS-yvdM BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1307 *Mycobacterium tuberculosis* Rv3400 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1219 *Mycobacterium leprae* spQ49741 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2753 *Mycobacterium leprae* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1277 *Escherichia coli* b1317 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2077 *Enterococcus faecium* (DOE) BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2099 *Enterococcus faecium* (DOE) BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2511 *Enterococcus faecium* (DOE) BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 895 *Enterococcus faecalis* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2037 *Enterococcus faecalis* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2784 *Enterococcus faecalis* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)

5\_4\_2\_6 517 *Clostridium difficile* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1119 *Clostridium difficile* BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 148 *Clostridium acetobutylicum* 14876450\_F3\_82 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 704 *Clostridium acetobutylicum* 33242942\_C2\_87 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1658 *Clostridium acetobutylicum* 4689375\_F1\_1 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 1870 *Clostridium acetobutylicum* 23471078\_C3\_38 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 2187 *Clostridium acetobutylicum* 417\_C3\_22 BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_6 3450 *Bacillus subtilis* yvdM BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_7 7525 *Yersinia pseudotuberculosis* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1288 *Yersinia pestis* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 6115 *Vibrio cholerae* El Tor N16961 ORF02977 PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 332 *Streptococcus pyogenes* deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 333 *Streptococcus pneumoniae* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 510 *Streptococcus mutans* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1450 *Streptococcus equi* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1893 *Staphylococcus aureus* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 2603 *Salmonella typhimurium* deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 3567 *Salmonella typhi* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1186 *Salmonella paratyphi* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1187 *Salmonella paratyphi* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 4036 *Salmonella enteritidis* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 4582 *Salmonella enteritidis* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 2152 *Salmonella dublin* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1818 *Klebsiella pneumoniae* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1819 *Klebsiella pneumoniae* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 577 *Helicobacter pylori* HP1179 PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 1095 *Helicobacter pylori* J99 deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 4265 *Escherichia coli* deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 5975 *Escherichia coli* yhfW PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 2348 *Enterococcus faecium* (DOE) PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 458 *Enterococcus faecalis* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 3069 *Clostridium difficile* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 4026 *Clostridium acetobutylicum* PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_7 2346 *Bacillus subtilis* drm PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_9 7116 *Bordetella bronchiseptica* PHOSPHOENOLPYRUVATE PHOSPHOMUTASE PRECURSOR (EC 5\_4\_2\_9)  
 5\_4\_3\_2 6168 *Yersinia pseudotuberculosis* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 831 *Yersinia pestis* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 6409 *Vibrio cholerae* El Tor N16961 ORF03362 L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 7 *Treponema pallidum* TP0121 L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 3062 *Salmonella typhimurium* yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 151 *Salmonella typhi* L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 4084 *Salmonella paratyphi* L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 4085 *Salmonella paratyphi* LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 1021 *Salmonella enteritidis* L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 1181 *Porphyromonas gingivalis* BS-yodO L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 487 *Pasteurella multocida* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 4972 *Klebsiella pneumoniae* L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 7957 *Haemophilus influenzae* HI0329 L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 1003 *Haemophilus ducreyi* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 6357 *Escherichia coli* yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 658 *Clostridium difficile* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_2 1966 *Bacillus subtilis* yodO L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_3 1523 *Porphyromonas gingivalis* D-LYSINE 5,6-AMINOMUTASE BETA SUBUNIT (EC 5\_4\_3\_3)  
 5\_4\_3\_3 1524 *Porphyromonas gingivalis* D-LYSINE 5,6-AMINOMUTASE ALPHA SUBUNIT (EC 5\_4\_3\_3)  
 5\_4\_3\_8 6619 *Yersinia pseudotuberculosis* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 3773 *Yersinia pestis* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 4485 *Vibrio cholerae* El Tor N16961 ORF00853 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)

5\_4\_3\_8 1366 *Staphylococcus aureus* Q9RL91 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 2509 *Staphylococcus aureus* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE 2 (EC 5\_4\_3\_8)  
 5\_4\_3\_8 488 *Salmonella typhimurium* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1548 *Salmonella typhi* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 4652 *Salmonella paratyphi* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1819 *Salmonella enteritidis* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 4535 *Salmonella dublin* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1163 *Pseudomonas aeruginosa* PA5523 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1873 *Pseudomonas aeruginosa* PA4088 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 8466 *Pseudomonas aeruginosa* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1477 *Pasteurella multocida* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1481 *Neisseria gonorrhoeae* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 2171 *Mycobacterium tuberculosis* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 334 *Mycobacterium leprae* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 3400 *Mycobacterium bovis* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 2919 *Klebsiella pneumoniae* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 2920 *Klebsiella pneumoniae* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 3091 *Klebsiella pneumoniae* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1253 *Helicobacter pylori* HP0306 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 296 *Helicobacter pylori* J99sp|Q9ZMD0 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 4355 *Escherichia coli* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 146 *Corynebacterium diphtheriae* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 440 *Clostridium acetobutylicum* 24337932\_C2\_81 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 201 *Chlamydia trachomatis* D/UW-3/Cx EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 634 *Chlamydia pneumoniae* AR39 CP0634 GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 125 *Chlamydia pneumoniae* CWL029 EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 353 *Campylobacter jejuni* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 1008 *Bordetella pertussis* GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 3748 *Bordetella pertussis* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 7780 *Bordetella bronchiseptica* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 870 *Bacillus subtilis* gsaB GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_3\_8 2806 *Bacillus subtilis* hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_99\_16 1514 *Salmonella typhimurium* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 4299 *Salmonella typhi* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 3515 *Salmonella paratyphi* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 4257 *Salmonella enteritidis* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 2127 *Salmonella dublin* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 2334 *Salmonella dublin* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 3213 *Pseudomonas aeruginosa* PA2162 MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)

5\_4\_99\_16 1184 *Mycobacterium tuberculosis* glgY MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 6 *Mycobacterium bovis* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 1323 *Bordetella pertussis* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_16 9712 *Bordetella bronchiseptica* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC 5\_4\_99\_16)  
 5\_4\_99\_5 6915 *Yersinia pseudotuberculosis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 6916 *Yersinia pseudotuberculosis* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 7354 *Yersinia pseudotuberculosis* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2149 *Yersinia pestis* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2830 *Yersinia pestis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 3648 *Yersinia pestis* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 4554 *Vibrio cholerae* El Tor N16961 ORF00940 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 4563 *Vibrio cholerae* El Tor N16961 ORF00951 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 1076 *Streptococcus pyogenes* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 443 *Streptococcus equi* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2048 *Staphylococcus aureus* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2181 *Staphylococcus aureus* BS-pheB CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 3905 *Salmonella typhimurium* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 3907 *Salmonella typhimurium* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 5163 *Salmonella typhimurium* aroQ MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 681 *Salmonella typhi* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 1837 *Salmonella typhi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 4595 *Salmonella typhi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 1601 *Salmonella paratyphi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 1603 *Salmonella paratyphi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 5702 *Salmonella paratyphi* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 79 *Salmonella enteritidis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 87 *Salmonella enteritidis* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 739 *Salmonella enteritidis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 1797 *Salmonella dublin* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 987 *Saccharomyces cerevisiae* ARO7 CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 6949 *Saccharomyces cerevisiae* TYR1 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 3027 *Pseudomonas aeruginosa* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 400 *Porphyromonas gingivalis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 572 *Pasteurella multocida* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)

5\_4\_99\_5 1599 *Pasteurella multocida* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 802 *Neisseria gonorrhoeae* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 1366 *Neisseria gonorrhoeae* pQ9ZHY3 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 4074 *Mycobacterium tuberculosis* Rv1885c MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 602 *Mycobacterium bovis* MONOFUNCTIONAL CHORISMATE MUTASE PRECURSOR (EC 5\_4\_99\_5)  
 5\_4\_99\_5 7342 *Klebsiella pneumoniae* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 280 *Helicobacter pylori* J99trQ9ZME4 CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 5998 *Haemophilus influenzae* HI1145 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 10001 *Haemophilus influenzae* HI1290 CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 281 *Haemophilus ducreyi* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 764 *Haemophilus ducreyi* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 765 *Haemophilus ducreyi* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 2535 *Escherichia coli* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 4327 *Escherichia coli* b0105 POSSIBLE CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 5568 *Escherichia coli* tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 5\_4\_99\_5 2436 *Enterococcus faecium* (DOE) PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 1359 *Enterococcus faecalis* BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 1995 *Clostridium difficile* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2417 *Clostridium difficile* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 2421 *Clostridium difficile* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 1750 *Clostridium acetobutylicum* 954438\_F2\_8 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 3246 *Clostridium acetobutylicum* 23991642\_C2\_11 CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 363 *Chlamydia trachomatis* D/UW-3/Cx BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 270 *Chlamydia pneumoniae* AR39 CP0270 PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 440 *Chlamydia pneumoniae* CWL029 BS-aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2276 *Campylobacter jejuni* pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 195 *Bordetella pertussis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 2692 *Bordetella pertussis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 2694 *Bordetella pertussis* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 7356 *Bordetella bronchiseptica* CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_5 2265 *Bacillus subtilis* aroH CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2785 *Bacillus subtilis* pheB CHORISMATE MUTASE (EC 5\_4\_99\_5)  
 5\_4\_99\_5 2969 *Bacillus subtilis* aroA PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE (EC 4\_1\_2\_15) / CHORISMATE MUTASE (EC 5\_4\_99\_5)

5\_4\_99\_6 8095 *Yersinia pseudotuberculosis* EC-menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 878 *Yersinia pestis* EC-menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4628 *Vibrio cholerae* El Tor N16961 ORF01035 ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 5771 *Vibrio cholerae* El Tor N16961 ORF02494 MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 2270 *Staphylococcus aureus* EC-menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1182 *Salmonella typhimurium* entC ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4345 *Salmonella typhimurium* menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 3027 *Salmonella typhi* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 3583 *Salmonella typhi* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 927 *Salmonella paratyphi* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1816 *Salmonella paratyphi* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 2921 *Salmonella paratyphi* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 3967 *Salmonella enteritidis* ISOCHORISMATE SYNTHASE ENTC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4102 *Salmonella enteritidis* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 496 *Salmonella dublin* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 6495 *Pseudomonas aeruginosa* pchA MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 966 *Pasteurella multocida* menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1562 *Mycobacterium tuberculosis* entC ISOCHORISMATE SYNTHASE ENTC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1787 *Mycobacterium leprae* EC-entC ISOCHORISMATE SYNTHASE ENTC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 2115 *Mycobacterium bovis* EC-entC ISOCHORISMATE SYNTHASE ENTC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1479 *Klebsiella pneumoniae* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1480 *Klebsiella pneumoniae* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4359 *Klebsiella pneumoniae* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4360 *Klebsiella pneumoniae* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4361 *Klebsiella pneumoniae* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 4362 *Klebsiella pneumoniae* ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 6382 *Klebsiella pneumoniae* MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 14026 *Haemophilus influenzae* HI0285 MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 237 *Haemophilus ducreyi* EC-menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 574 *Escherichia coli* entC ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 5373 *Escherichia coli* menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 2538 *Enterococcus faecalis* BS-menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 1938 *Corynebacterium diphtheriae* ISOCHORISMATE SYNTHASE ENTC (EC 5\_4\_99\_6)  
 5\_4\_99\_6 3077 *Bacillus subtilis* menF MENAQUINONE-SPECIFIC ISOCHORISMATE SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_6 3194 *Bacillus subtilis* dhbC ISOCHORISMATE SYNTHASE DHBC (EC 5\_4\_99\_6)  
 5\_4\_99\_9 5269 *Salmonella typhimurium* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 3335 *Salmonella typhi* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 5734 *Salmonella paratyphi* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 558 *Mycoplasma pneumoniae* MP558 UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 247 *Mycoplasma genitalium* MG137 UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 3216 *Mycobacterium tuberculosis* glf UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 3057 *Mycobacterium leprae* EC-yefE UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 2487 *Mycobacterium bovis* EC-yefE UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 2750 *Mycobacterium bovis* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)

5\_4\_99\_9 5231 *Escherichia coli* yefE UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 1338 *Enterococcus faecalis* EC-yefE UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 1469 *Corynebacterium diphtheriae* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 2453 *Clostridium acetobutylicum* 3945463\_C2\_30 UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_4\_99\_9 717 *Campylobacter jejuni* glf UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_5\_1\_1 310 *Pseudomonas aeruginosa* catB MUONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_1 94 *Porphyromonas gingivalis* BS-ykfB MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 3274 *Mycobacterium tuberculosis* menC MUONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_1 3301 *Mycobacterium leprae* EC-menC MUONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_1 2657 *Mycobacterium bovis* MUONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_1 2302 *Klebsiella pneumoniae* MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 2303 *Klebsiella pneumoniae* MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 2304 *Klebsiella pneumoniae* MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 2937 *Enterococcus faecalis* BS-ykfB MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 869 *Corynebacterium diphtheriae* MUONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_1 1468 *Clostridium difficile* EC-menC MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 500 *Clostridium acetobutylicum* 24226692\_C3\_67 MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_1 1299 *Bacillus subtilis* ykfB MUONATE CYCLOISOMERASE I (EC 5\_5\_1\_1)  
 5\_5\_1\_2 2128 *Pseudomonas aeruginosa* pcaB 3-CARBOXY-CIS,CIS-MUONATE CYCLOISOMERASE (EC 5\_5\_1\_2)  
 5\_5\_1\_5 7814 *Yersinia pseudotuberculosis* EC-ybhE CARBOXY-CIS,CIS-MUONATE CYCLASE (EC 5\_5\_1\_5)  
 5\_5\_1\_5 3361 *Staphylococcus aureus* EC-ybhE CARBOXY-CIS,CIS-MUONATE CYCLASE (EC 5\_5\_1\_5)  
 5\_5\_1\_5 103 *Neurospora crassa* AAA21020\_1 CARBOXY-CIS,CIS-MUONATE CYCLASE (EC 5\_5\_1\_5)  
 5\_5\_1\_5 2941 *Klebsiella pneumoniae* CARBOXY-CIS,CIS-MUONATE CYCLASE (EC 5\_5\_1\_5)  
 5\_5\_1\_7 7476 *Yersinia pseudotuberculosis* BS-ykfB CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 1725 *Yersinia pestis* BS-ykfB CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 5621 *Salmonella typhimurium* ycjG CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 2411 *Salmonella typhi* CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 6122 *Salmonella paratyphi* CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 6123 *Salmonella paratyphi* CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 1422 *Klebsiella pneumoniae* CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 1423 *Klebsiella pneumoniae* CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 5\_5\_1\_7 1285 *Escherichia coli* b1325 CHLOROMUONATE CYCLOISOMERASE (EC 5\_5\_1\_7)  
 6\_2\_1\_12 8479 *Pseudomonas aeruginosa* PA3860 4-COUMARATE--COA LIGASE 2 (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2377 *Mycobacterium tuberculosis* fadD8 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 3637 *Mycobacterium tuberculosis* fadD5 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 4593 *Mycobacterium tuberculosis* fadD35 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 5654 *Mycobacterium tuberculosis* fadD36 4-COUMARATE--COA LIGASE 1 (EC 6\_2\_1\_12)  
 6\_2\_1\_12 1107 *Mycobacterium leprae*trjQ50017 4-COUMARATE--COA LIGASE 1 (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2356 *Mycobacterium bovis* BS-lcfA 4-COUMARATE--COA LIGASE 1 (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2655 *Mycobacterium bovis* 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2954 *Mycobacterium bovis* 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2091 *Corynebacterium diphtheriae* 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 2688 *Bordetella pertussis* 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 5696 *Bordetella bronchiseptica* 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 7227 *Bordetella bronchiseptica* 4-COUMARATE--COA LIGASE 2 (EC 6\_2\_1\_12)  
 6\_2\_1\_12 1027 *Bacillus subtilis* yhfL 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_12 1824 *Bacillus subtilis* yngI 4-COUMARATE--COA LIGASE (EC 6\_2\_1\_12)  
 6\_2\_1\_14 6490 *Yersinia pseudotuberculosis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 1665 *Yersinia pestis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 7080 *Vibrio cholerae* El Tor N16961ORFA00232 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3269 *Staphylococcus aureus* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3700 *Staphylococcus aureus* BS-bioW 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5072 *Salmonella typhimurium* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 6891 *Salmonella typhimurium* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 4635 *Salmonella typhi* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3031 *Salmonella paratyphi* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3032 *Salmonella paratyphi* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3248 *Salmonella dublin* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)



6\_2\_1\_14 6742 *Pseudomonas aeruginosa* PA4978 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 7178 *Pseudomonas aeruginosa* pauA 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 554 *Porphyromonas gingivalis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5515 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5516 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5517 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5518 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5519 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5520 *Klebsiella pneumoniae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 2524 *Escherichia coli* b2584 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 2008 *Corynebacterium diphtheriae* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 1623 *Clostridium difficile* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 66 *Bordetella pertussis* gj313841 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 627 *Bordetella pertussis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 2312 *Bordetella pertussis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 2547 *Bordetella pertussis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 2628 *Bordetella pertussis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3058 *Bordetella pertussis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5070 *Bordetella bronchiseptica* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5093 *Bordetella bronchiseptica* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5701 *Bordetella bronchiseptica* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 5852 *Bordetella bronchiseptica* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 9692 *Bordetella bronchiseptica* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_14 3018 *Bacillus subtilis* bioW 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_17 5165 *Vibrio cholerae* El Tor N16961 ORF01729 propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 4760 *Salmonella typhimurium* prpE propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 2272 *Salmonella typhi* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 3657 *Salmonella paratyphi* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 3658 *Salmonella paratyphi* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 3659 *Salmonella paratyphi* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 3437 *Salmonella enteritidis* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 4711 *Pseudomonas aeruginosa* PA3568 propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 319 *Escherichia coli* b0335 propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 2252 *Bordetella pertussis* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_17 5171 *Bordetella bronchiseptica* propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_21 1358 *Escherichia coli* b1398 phenylacetate--CoA ligase (EC 6\_2\_1\_21)  
 6\_2\_1\_22 4651 *Vibrio cholerae* El Tor N16961 ORF01068 [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 291 *Streptococcus pyogenes* citC [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 1476 *Streptococcus mutans* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 188 *Streptococcus equi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 3279 *Salmonella typhimurium* citC [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 3631 *Salmonella typhimurium* citC [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 2136 *Salmonella typhi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 4546 *Salmonella typhi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 2524 *Salmonella paratyphi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 2525 *Salmonella paratyphi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 2941 *Salmonella paratyphi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 267 *Salmonella enteritidis* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 3168 *Salmonella enteritidis* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 3106 *Salmonella dublin* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 3561 *Salmonella dublin* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 116 *Klebsiella pneumoniae* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 21804 *Haemophilus influenzae* HI0025 [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 630 *Haemophilus ducreyi* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 4552 *Escherichia coli* b0618 [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_22 1014 *Enterococcus faecalis* [CITRATE (PRO-3S) -LYASE] LIGASE (EC 6\_2\_1\_22)  
 6\_2\_1\_25 538 *Mycobacterium tuberculosis* fadD22 BENZOATE-COENZYME A LIGASE (EC 6\_2\_1\_25)  
 6\_2\_1\_25 204 *Mycobacterium bovis* BENZOATE-COENZYME A LIGASE (EC 6\_2\_1\_25)  
 6\_2\_1\_25 1004 *Bordetella pertussis* BENZOATE-COENZYME A LIGASE (EC 6\_2\_1\_25)  
 6\_2\_1\_25 6627 *Bordetella bronchiseptica* BENZOATE-COENZYME A LIGASE (EC 6\_2\_1\_25)



6\_2\_1\_26 8100 *Yersinia pseudotuberculosis* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 2267 *Yersinia pestis* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 5766 *Vibrio cholerae* El Tor N16961 ORF02487 O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 3507 *Staphylococcus aureus* sp|Q53634 O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 127 *Salmonella typhimurium* menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 2636 *Salmonella typhi* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 862 *Salmonella paratyphi* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 863 *Salmonella paratyphi* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 145 *Salmonella enteritidis* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 4692 *Salmonella dublin* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 93 *Porphyromonas gingivalis* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 628 *Pasteurella multocida* menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 2195 *Mycobacterium tuberculosis* menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 1074 *Mycobacterium leprae* sp|Q50170 O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 2823 *Mycobacterium bovis* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 3695 *Klebsiella pneumoniae* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 3696 *Klebsiella pneumoniae* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 7649 *Haemophilus influenzae* HI0194 O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 607 *Haemophilus ducreyi* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 5368 *Escherichia coli* menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 2537 *Enterococcus faecalis* BS-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 99 *Corynebacterium diphtheriae* O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_26 3073 *Bacillus subtilis* menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC 6\_2\_1\_26)  
 6\_2\_1\_5 5649 *Yersinia pseudotuberculosis* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 5650 *Yersinia pseudotuberculosis* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 138 *Yersinia pestis* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4283 *Yersinia pestis* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 5878 *Vibrio cholerae* El Tor N16961 ORF02630 SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 5879 *Vibrio cholerae* El Tor N16961 ORF02632 SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2985 *Staphylococcus aureus* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4455 *Salmonella typhimurium* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4456 *Salmonella typhimurium* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 463 *Salmonella typhi* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4242 *Salmonella typhi* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4856 *Salmonella paratyphi* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4857 *Salmonella paratyphi* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 4858 *Salmonella paratyphi* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 3751 *Salmonella enteritidis* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 3752 *Salmonella enteritidis* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1873 *Salmonella dublin* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2802 *Salmonella dublin* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 423 *Rickettsia prowazekii* RP432 SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 424 *Rickettsia prowazekii* RP433 SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1727 *Pseudomonas aeruginosa* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 8108 *Pseudomonas aeruginosa* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 401 *Pasteurella multocida* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 402 *Pasteurella multocida* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 846 *Neisseria gonorrhoeae* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 847 *Neisseria gonorrhoeae* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 42 *Mycobacterium tuberculosis* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 43 *Mycobacterium tuberculosis* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1680 *Mycobacterium leprae* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2334 *Mycobacterium leprae* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2575 *Mycobacterium bovis* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2576 *Mycobacterium bovis* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)

6\_2\_1\_5 3990 *Klebsiella pneumoniae* SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 3991 *Klebsiella pneumoniae* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 3992 *Klebsiella pneumoniae* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2556 *Haemophilus influenzae* HII 197 SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 6118 *Haemophilus influenzae* HII 196 SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 304 *Escherichia coli* b0320 SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 702 *Escherichia coli* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 703 *Escherichia coli* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 2444 *Enterococcus faecalis* SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 785 *Chlamydia trachomatis* D/UW-3/Cx EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 786 *Chlamydia trachomatis* D/UW-3/Cx sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 885 *Chlamydia pneumoniae* AR39 CP0885 SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 886 *Chlamydia pneumoniae* AR39 CP0886 SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 899 *Chlamydia pneumoniae* CWL029 EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 900 *Chlamydia pneumoniae* CWL029 sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1484 *Campylobacter jejuni* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1485 *Campylobacter jejuni* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 557 *Bordetella pertussis* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 558 *Bordetella pertussis* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 8262 *Bordetella bronchiseptica* EC-sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 8263 *Bordetella bronchiseptica* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1609 *Bacillus subtilis* sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_5 1610 *Bacillus subtilis* sucD SUCCINYL-COA SYNTHETASE ALPHA CHAIN (EC 6\_2\_1\_5)  
 6\_2\_1\_6 4151 *Pseudomonas aeruginosa* PA1188 GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 4176 *Pseudomonas aeruginosa* PA3733 GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 6001 *Pseudomonas aeruginosa* PA3592 GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 48 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 962 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 1332 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 1436 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 1508 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 1701 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 2326 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 2885 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 2886 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 3167 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 3197 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 4023 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 4232 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 4464 *Bordetella pertussis* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 5387 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 5650 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 6166 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 7019 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 7543 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 7817 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 8319 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 8328 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_6 8996 *Bordetella bronchiseptica* GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_8 5444 *Escherichia coli* b2371 FORMATE--COA LIGASE (EC 6\_2\_1\_8)  
 6\_3\_1\_1 5949 *Yersinia pseudotuberculosis* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 2452 *Yersinia pestis* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 503 *Ureaplasma urealyticum* UU363 ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 1021 *Treponema pallidum* TP0556 ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 1438 *Streptococcus pyogenes* asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)

6\_3\_1\_1 1779 *Streptococcus pneumoniae* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 127 *Streptococcus equi* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 2119 *Salmonella typhimurium* asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 5471 *Salmonella typhi* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 5099 *Salmonella paratyphi* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 744 *Salmonella enteritidis* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 1715 *Salmonella dublin* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 15 *Pasteurella multocida* asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 2774 *Klebsiella pneumoniae* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 2775 *Klebsiella pneumoniae* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 8473 *Haemophilus influenzae* HI0564 ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 52 *Haemophilus ducreyi* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 3662 *Escherichia coli* asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 1774 *Clostridium difficile* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_1 2452 *Clostridium difficile* ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_8 6658 *Salmonella typhimurium* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 3398 *Salmonella typhi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE  
 [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE  
 AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 5497 *Salmonella paratyphi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 5498 *Salmonella paratyphi* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 3827 *Salmonella enteritidis* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 4494 *Salmonella dublin* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE  
 [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) (GLUTATHIONE:SPERMIDINE  
 LIGASE (ADP-FORMING)) (GSP SYNTHETASE) ; GLUTATHIONYLSPERMIDINE AMIDASE (EC  
 3\_5\_1\_78) (GLUTATHIONYLSPERMIDINE AMIDOHYDROLASE [SPERMIDINE- FORMING]) (GSP  
 AMIDASE) ]  
 6\_3\_1\_8 4641 *Klebsiella pneumoniae* BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_1\_8 5772 *Escherichia coli* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_2\_1 7187 *Yersinia pseudotuberculosis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 4941 *Yersinia pestis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 4450 *Vibrio cholerae* El Tor N16961 ORF00812 PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 3010 *Staphylococcus aureus* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1985 *Salmonella typhimurium* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2469 *Salmonella typhi* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 7407 *Salmonella paratyphi* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2578 *Salmonella dublin* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 3574 *Saccharomyces cerevisiae* YIL145C PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 7778 *Pseudomonas aeruginosa* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 307 *Porphyromonas gingivalis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1189 *Neisseria gonorrhoeae* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2982 *Mycobacterium tuberculosis* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 3412 *Mycobacterium leprae* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1832 *Klebsiella pneumoniae* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1833 *Klebsiella pneumoniae* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1834 *Klebsiella pneumoniae* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 972 *Helicobacter pylori* HP0006 PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 6 *Helicobacter pylori* J99sp|Q9ZN52 PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 4340 *Escherichia coli* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1076 *Enterococcus faecium* (DOE) PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)

6\_3\_2\_1 3270 *Enterococcus faecium* (DOE) PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 1844 *Enterococcus faecalis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 352 *Corynebacterium diphtheriae* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2138 *Corynebacterium diphtheriae* PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 224 *Clostridium difficile* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 998 *Clostridium acetobutylicum* 26594013\_C3\_55 PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2251 *Campylobacter jejuni* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 3188 *Bordetella pertussis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 9018 *Bordetella bronchiseptica* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_1 2238 *Bacillus subtilis* panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_12 5479 *Yersinia pseudotuberculosis* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 6763 *Yersinia pseudotuberculosis* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 4105 *Yersinia pestis* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 4831 *Vibrio cholerae* El Tor N16961 ORF01324 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 880 *Treponema pallidum* TP0340 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 154 *Streptococcus pyogenes* folC\_2 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 941 *Streptococcus pyogenes* folC\_1 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 610 *Streptococcus pneumoniae* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1669 *Streptococcus pneumoniae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 729 *Streptococcus mutans* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 122 *Streptococcus equi* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2225 *Staphylococcus aureus* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2599 *Staphylococcus aureus* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1337 *Salmonella typhimurium* dedC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 5193 *Salmonella typhi* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 777 *Salmonella paratyphi* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 6471 *Salmonella paratyphi* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2567 *Salmonella dublin* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 425 *Saccharomyces cerevisiae* FOL3 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 943 *Saccharomyces cerevisiae* RMA1 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 8159 *Saccharomyces cerevisiae* MET7 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 519 *Rickettsia prowazekii* RP536 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 5472 *Pseudomonas aeruginosa* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1022 *Porphyromonas gingivalis* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 135 *Pasteurella multocida* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)

6\_3\_2\_12 71 *Neurospora crassa* met6+ FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1691 *Neisseria gonorrhoeae* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 5856 *Mycobacterium tuberculosis* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1835 *Mycobacterium leprae* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1710 *Mycobacterium bovis* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1400 *Klebsiella pneumoniae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1401 *Klebsiella pneumoniae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1402 *Klebsiella pneumoniae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1403 *Klebsiella pneumoniae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 922 *Helicobacter pylori* HP1545 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1443 *Helicobacter pylori* J99 folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2675 *Haemophilus influenzae* HI1261 FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 965 *Haemophilus ducreyi* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 5409 *Escherichia coli* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2073 *Enterococcus faecium* (DOE) FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 896 *Enterococcus faecalis* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 593 *Corynebacterium diphtheriae* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1193 *Clostridium difficile* EC-folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 912 *Clostridium acetobutylicum* 25663567\_C1\_66 FOLYLPOLYGLUTAMATE SYNTHASE (EC  
 6\_3\_2\_17) / DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1646 *Campylobacter jejuni* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 1832 *Bordetella pertussis* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_12 2802 *Bacillus subtilis* folC FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_13 5376 *Yersinia pseudotuberculosis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-  
 GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 5784 *Yersinia pseudotuberculosis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 4737 *Yersinia pestis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 4738 *Yersinia pestis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 4739 *Yersinia pestis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 683 *Vibrio cholerae* El Tor N16961 ORF03043 UDP-N-ACETYLMURAMOYLALANYL-D-  
 GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 700 *Treponema pallidum* TP0933 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 626 *Streptococcus pyogenes* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 955 *Streptococcus pyogenes* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-  
 DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)

6\_3\_2\_13 479 *Streptococcus pneumoniae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1664 *Streptococcus pneumoniae* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1341 *Streptococcus mutans* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1405 *Streptococcus mutans* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1669 *Streptococcus mutans* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 748 *Streptococcus equi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1104 *Streptococcus equi* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3068 *Staphylococcus aureus* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2366 *Salmonella typhimurium* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 101 *Salmonella typhi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3894 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3895 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3896 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2620 *Salmonella enteritidis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 576 *Rickettsia prowazekii* RP597 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 6739 *Pseudomonas aeruginosa* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1145 *Porphyromonas gingivalis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 585 *Pasteurella multocida* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 642 *Pasteurella multocida* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 361 *Neisseria gonorrhoeae* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3875 *Mycobacterium tuberculosis* Rv3712 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 5809 *Mycobacterium tuberculosis* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1370 *Mycobacterium leprae* O69522 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2874 *Mycobacterium leprae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2875 *Mycobacterium leprae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1122 *Mycobacterium bovis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3532 *Mycobacterium bovis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1988 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1990 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 875 *Helicobacter pylori* HP1494 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1374 *Helicobacter pylori* J99sp|Q9ZJC6 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)

6\_3\_2\_13 9664 *Haemophilus influenzae* H1133 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1416 *Haemophilus ducreyi* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 85 *Escherichia coli* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1598 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3085 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3339 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 682 *Enterococcus faecalis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2644 *Enterococcus faecalis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2848 *Enterococcus faecalis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 207 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 947 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 791 *Clostridium difficile* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1792 *Clostridium acetobutylicum* 24250290\_C1\_38 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2723 *Clostridium acetobutylicum* 1461635\_F1\_2 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 2875 *Clostridium acetobutylicum* 25587787\_F2\_2 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3172 *Clostridium acetobutylicum* 7243807\_F2\_4 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 4016 *Clostridium acetobutylicum* 15835900\_F2\_1 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 257 *Chlamydia trachomatis* D/UW-3/Cx EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 336 *Chlamydia pneumoniae* AR39 CP0336 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 378 *Chlamydia pneumoniae* CWL029 EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 965 *Campylobacter jejuni* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 539 *Borrelia burgdorferi* BB0201 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1256 *Bordetella pertussis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 3977 *Bordetella pertussis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 6814 *Bordetella bronchiseptica* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 7664 *Bordetella bronchiseptica* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_13 1519 *Bacillus subtilis* murE UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_15 5375 *Yersinia pseudotuberculosis* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D-ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1164 *Yersinia pestis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D-ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 6172 *Vibrio cholerae* El Tor N16961 ORF03042 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D-ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 243 *Treponema pallidum* TP0386 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D-ALANYL LIGASE (EC 6\_3\_2\_15)



6\_3\_2\_15 456 *Streptococcus pyogenes* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1648 *Streptococcus pneumoniae* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 746 *Streptococcus mutans* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 33 *Streptococcus equi* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 2369 *Salmonella typhimurium* mra UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 141 *Salmonella typhi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 3897 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 3898 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 2619 *Salmonella enteritidis* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 4344 *Salmonella dublin* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 575 *Rickettsia prowazekii* RP596 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 4749 *Pseudomonas aeruginosa* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1494 *Porphyromonas gingivalis* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 584 *Pasteurella multocida* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1596 *Neisseria gonorrhoeae* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 5158 *Mycobacterium tuberculosis* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1934 *Mycobacterium leprae*trjO69556 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1050 *Mycobacterium bovis* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1991 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 167 *Helicobacter pylori* HP0740 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 677 *Helicobacter pylori* J99trjQ9ZLA3 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 2427 *Haemophilus influenzae* HI1134 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1417 *Haemophilus ducreyi* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 86 *Escherichia coli* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 2457 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 84 *Enterococcus faecalis* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 208 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1163 *Clostridium difficile* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 1791 *Clostridium acetobutylicum* 198578\_C1\_39 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 4018 *Clostridium acetobutylicum* 48828124\_C3\_6 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 725 *Chlamydia trachomatis* D/UW-3/Cx murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)



6\_3\_2\_15 967 *Chlamydia pneumoniae* AR39 CP0967 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 831 *Chlamydia pneumoniae* CWL029 EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 449 *Campylobacter jejuni* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 437 *Borrelia burgdorferi* BB0304 UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 7511 *Bordetella bronchiseptica* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_15 457 *Bacillus subtilis* murF UDP-N-ACETYLMURAMOYLALANYL-D-GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_4 7935 *Yersinia pseudotuberculosis* EC-ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 463 *Yersinia pestis* EC-ddlB D-ALANINE--D-ALANINE LIGASE B (EC 6\_3\_2\_4)  
 6\_3\_2\_4 7078 *Vibrio cholerae* El Tor N16961ORFA00230 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 561 *Treponema pallidum* TP0670 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 457 *Streptococcus pyogenes* ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 122 *Streptococcus pneumoniae* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 154 *Streptococcus mutans* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1509 *Streptococcus equi* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 357 *Salmonella typhimurium* ddlA D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 6275 *Salmonella typhimurium* ddl D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 741 *Salmonella typhi* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 4369 *Salmonella typhi* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 2736 *Salmonella paratyphi* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 4793 *Salmonella paratyphi* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 4794 *Salmonella paratyphi* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1911 *Salmonella enteritidis* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 871 *Salmonella dublin* D-ALANINE--D-ALANINE LIGASE B (EC 6\_3\_2\_4)  
 6\_3\_2\_4 3772 *Salmonella dublin* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 243 *Rickettsia prowazekii* RP249 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 628 *Pseudomonas aeruginosa* ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1748 *Pseudomonas aeruginosa* ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1116 *Porphyromonas gingivalis* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 578 *Pasteurella multocida* ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1604 *Neisseria gonorrhoeae* EC-ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 829 *Mycobacterium tuberculosis* ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 2271 *Mycobacterium leprae* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1535 *Mycobacterium bovis* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 3228 *Klebsiella pneumoniae* D-ALANINE--D-ALANINE LIGASE B (EC 6\_3\_2\_4)  
 6\_3\_2\_4 3229 *Klebsiella pneumoniae* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 7173 *Klebsiella pneumoniae* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 7174 *Klebsiella pneumoniae* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 7175 *Klebsiella pneumoniae* D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 165 *Helicobacter pylori* HP0738 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 675 *Helicobacter pylori* J99sp1Q9ZLA5 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 5993 *Haemophilus influenzae* HI1140 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 243 *Haemophilus ducreyi* EC-ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 92 *Escherichia coli* ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 4452 *Escherichia coli* ddlA D-ALANINE--D-ALANINE LIGASE A (EC 6\_3\_2\_4)  
 6\_3\_2\_4 2455 *Enterococcus faecium* (DOE) D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 83 *Enterococcus faecalis* EC-ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1928 *Corynebacterium diphtheriae* D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 3187 *Clostridium difficile* EC-ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 2043 *Clostridium acetobutylicum* 4114717\_C2\_32 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 731 *Chlamydia trachomatis* D/UW-3/CxmurC/ddlA UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 961 *Chlamydia pneumoniae* AR39 CP0961 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 837 *Chlamydia pneumoniae* CWL029murC/ddlA UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 446 *Campylobacter jejuni* ddlA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)

6\_3\_2\_4 541 *Borrelia burgdorferi* BB0200 D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 1250 *Bordetella pertussis* EC-ddIB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 9008 *Bordetella bronchiseptica* EC-ddIB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_4 456 *Bacillus subtilis* ddIA D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_5 6572 *Yersinia pseudotuberculosis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 546 *Yersinia pestis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 4097 *Vibrio cholerae* El Tor N16961 ORF00307 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 1049 *Staphylococcus aureus* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 6016 *Salmonella typhimurium* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 511 *Salmonella typhi* PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 8 *Pseudomonas aeruginosa* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 651 *Porphyromonas gingivalis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 1846 *Pasteurella multocida* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 1026 *Neisseria gonorrhoeae* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 438 *Mycobacterium tuberculosis* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 3501 *Mycobacterium leprae* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 2319 *Mycobacterium bovis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 263 *Helicobacter pylori* HP0841 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 778 *Helicobacter pylori* J99 dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 2027 *Haemophilus influenzae* HI0953 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 1180 *Haemophilus ducreyi* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 3559 *Escherichia coli* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 325 *Corynebacterium diphtheriae* PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 147 *Clostridium difficile* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 2957 *Clostridium acetobutylicum* 26601507\_C3\_23 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 401 *Campylobacter jejuni* dfp PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 363 *Borrelia burgdorferi* BB0812 PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_5 1570 *Bacillus subtilis* yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_8 7936 *Yersinia pseudotuberculosis* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3194 *Yersinia pestis* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4778 *Yersinia pestis* EC-yjFG UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 6167 *Vibrio cholerae* El Tor N16961 ORF03037 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 881 *Treponema pallidum* TP0341 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1252 *Streptococcus pyogenes* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1269 *Streptococcus pneumoniae* BS-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)

6\_3\_2\_8 1610 *Streptococcus mutans* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 230 *Streptococcus equi* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 27 *Staphylococcus aureus* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 6274 *Salmonella typhimurium* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 979 *Salmonella typhi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2479 *Salmonella typhi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2737 *Salmonella paratyphi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2738 *Salmonella paratyphi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4232 *Salmonella paratyphi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4233 *Salmonella paratyphi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4234 *Salmonella paratyphi* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3170 *Salmonella enteritidis* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 960 *Salmonella dublin* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 241 *Rickettsia prowazekii* RP247 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 627 *Pseudomonas aeruginosa* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 5121 *Pseudomonas aeruginosa* mpl UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 115 *Porphyromonas gingivalis* BS-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 579 *Pasteurella multocida* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1735 *Pasteurella multocida* EC-yjfg UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 629 *Neisseria gonorrhoeae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1602 *Neisseria gonorrhoeae* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2419 *Mycobacterium tuberculosis* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1634 *Mycobacterium leprae* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3230 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3231 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3232 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3233 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4020 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 57 *Helicobacter pylori* HP0623 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 568 *Helicobacter pylori* J99sp|Q9ZLL2 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 9675 *Haemophilus influenzae* HI1139 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 14382 *Haemophilus influenzae* HI0121 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 244 *Haemophilus ducreyi* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1542 *Haemophilus ducreyi* EC-yjfg UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 91 *Escherichia coli* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 4116 *Escherichia coli* yjfg UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1554 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2144 *Enterococcus faecalis* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 2943 *Enterococcus faecalis* BS-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 587 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1190 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 3172 *Clostridium difficile* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 142 *Clostridium acetobutylicum* 10968752\_F3\_76 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 731 *Chlamydia trachomatis* D/UW-3/CxmurC/ddIA UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_8 961 *Chlamydia pneumoniae* AR39 CP0961 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_8 837 *Chlamydia pneumoniae* CWL029murC/ddIA UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8) / D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_8 1697 *Campylobacter jejuni* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 317 *Borrelia burgdorferi* BB0817 UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
 6\_3\_2\_8 1251 *Bordetella pertussis* BS-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)

6\_3\_2\_8 1842 *Bordetella pertussis* UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
6\_3\_2\_8 1843 *Bordetella pertussis* EC-yjFG UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
6\_3\_2\_8 7453 *Bordetella bronchiseptica* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
6\_3\_2\_8 2973 *Bacillus subtilis* murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE (EC 6\_3\_2\_8)  
6\_3\_2\_9 7939 *Yersinia pseudotuberculosis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1166 *Yersinia pestis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 6170 *Vibrio cholerae* El Tor N16961 ORF03040 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 641 *Treponema pallidum* TP0859 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 679 *Treponema pallidum* TP0903 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1450 *Streptococcus pyogenes* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1260 *Streptococcus pneumoniae* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 686 *Streptococcus mutans* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 622 *Streptococcus equi* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 2449 *Staphylococcus aureus* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 3648 *Staphylococcus aureus* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 2371 *Salmonella typhimurium* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 2476 *Salmonella typhi* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 3900 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 3901 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 7285 *Salmonella paratyphi* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 4342 *Salmonella dublin* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 401 *Rickettsia prowazekii* RP410 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 4754 *Pseudomonas aeruginosa* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1147 *Porphyromonas gingivalis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 582 *Pasteurella multocida* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1599 *Neisseria gonorrhoeae* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 5156 *Mycobacterium tuberculosis* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1631 *Mycobacterium leprae* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1789 *Mycobacterium bovis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1011 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1012 *Klebsiella pneumoniae* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
6\_3\_2\_9 1416 *Helicobacter pylori* HP0494 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC 6\_3\_2\_9)

6\_3\_2\_9 451 *Helicobacter pylori* J99tr|Q9ZLY0 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 5988 *Haemophilus influenzae* HII 136 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 1419 *Haemophilus ducreyi* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 88 *Escherichia coli* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC  
 6\_3\_2\_9)  
 6\_3\_2\_9 3458 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 3465 *Enterococcus faecium* (DOE) UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 1936 *Enterococcus faecalis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 590 *Corynebacterium diphtheriae* UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 1161 *Clostridium difficile* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 270 *Clostridium acetobutylicum* 4720392\_F2\_6 UDP-N-ACETYLMURAMOYLALANINE--D-  
 GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 727 *Chlamydia trachomatis* D/UW-3/Cx EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-  
 GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 965 *Chlamydia pneumoniae* AR39 CP0965 UDP-N-ACETYLMURAMOYLALANINE--D-  
 GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 833 *Chlamydia pneumoniae* CWL029 EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-  
 GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 210 *Campylobacter jejuni* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE  
 (EC 6\_3\_2\_9)  
 6\_3\_2\_9 171 *Borrelia burgdorferi* BB0585 UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 1254 *Bordetella pertussis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 7456 *Bordetella bronchiseptica* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE  
 LIGASE (EC 6\_3\_2\_9)  
 6\_3\_2\_9 1521 *Bacillus subtilis* murD UDP-N-ACETYLMURAMOYLALANINE--D-GLUTAMATE LIGASE (EC  
 6\_3\_2\_9)  
 6\_3\_3\_3 4728 *Yersinia pseudotuberculosis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 5067 *Yersinia pseudotuberculosis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 7846 *Yersinia pseudotuberculosis* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 2241 *Yersinia pestis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3846 *Yersinia pestis* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 4941 *Vibrio cholerae* El Tor N16961 ORF01458 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 2636 *Staphylococcus aureus* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1775 *Salmonella typhimurium* bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3119 *Salmonella typhimurium* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1020 *Salmonella typhi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 4851 *Salmonella typhi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 2096 *Salmonella paratyphi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 2098 *Salmonella paratyphi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 4046 *Salmonella paratyphi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 457 *Salmonella enteritidis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3549 *Salmonella enteritidis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3781 *Salmonella dublin* PUTATIVE DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 7637 *Saccharomyces cerevisiae* BIO4 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 4678 *Pseudomonas aeruginosa* bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1240 *Porphyromonas gingivalis* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1178 *Pasteurella multocida* bioD2 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1577 *Pasteurella multocida* bioD1 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 759 *Neisseria gonorrhoeae* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 2618 *Mycobacterium tuberculosis* bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1578 *Mycobacterium leprae*sp|P45486 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 1933 *Klebsiella pneumoniae* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)

6\_3\_3\_3 1934 *Klebsiella pneumoniae* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 7618 *Klebsiella pneumoniae* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 991 *Helicobacter pylori* HP0029 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 24 *Helicobacter pylori* J99 bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 11517 *Haemophilus influenzae* HI1445 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 18630 *Haemophilus influenzae* HI1550 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 554 *Haemophilus ducreyi* EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 951 *Haemophilus ducreyi* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 745 *Escherichia coli* bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 5000 *Escherichia coli* b1593 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 822 *Corynebacterium diphtheriae* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3487 *Clostridium acetobutylicum* 19657691\_C1\_7 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 810 *Chlamydia pneumoniae* AR39 CP0810 DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 964 *Chlamydia pneumoniae* CWL029 EC-bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_3\_3 3015 *Bacillus subtilis* bioD DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_4\_6 4285 *Yersinia pseudotuberculosis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 2282 *Yersinia pestis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 7283 *Vibrio cholerae* El Tor N16961ORFA00493 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 7284 *Vibrio cholerae* El Tor N16961ORFA00494 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 922 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 923 *Staphylococcus aureus* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 1360 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 1361 *Staphylococcus aureus* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 5051 *Salmonella typhimurium* ybgK UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 5052 *Salmonella typhimurium* ybgJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 3339 *Salmonella typhi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 4842 *Salmonella typhi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 3245 *Salmonella paratyphi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 3246 *Salmonella paratyphi* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 3905 *Salmonella dublin* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 6608 *Saccharomyces cerevisiae* DUR1,2 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 2353 *Pseudomonas aeruginosa* PA4510 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 2354 *Pseudomonas aeruginosa* PA4509 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 4869 *Pseudomonas aeruginosa* PA2110 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 5257 *Pseudomonas aeruginosa* PA0495 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54) / BIOTIN CARBOXYLASE (EC 6\_3\_4\_14)  
 6\_3\_4\_6 5258 *Pseudomonas aeruginosa* PA0496 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 8451 *Pseudomonas aeruginosa* PA2111 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 6\_3\_4\_6 2743 *Mycobacterium tuberculosis* Rv0263c UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)

6\_3\_4\_6 2744 *Mycobacterium tuberculosis* Rv0264c UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 421 *Mycobacterium leprae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 422 *Mycobacterium leprae* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 3460 *Mycobacterium bovis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 3461 *Mycobacterium bovis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 1735 *Klebsiella pneumoniae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 1737 *Klebsiella pneumoniae* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 14660 *Haemophilus influenzae* HII730 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 18274 *Haemophilus influenzae* HII731 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 685 *Escherichia coli* b0711 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 686 *Escherichia coli* b0712 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 271 *Clostridium difficile* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 272 *Clostridium difficile* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 2019 *Campylobacter jejuni* Cj1542 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 2021 *Campylobacter jejuni* Cj1543 UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 4415 *Bordetella pertussis* UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
6\_3\_4\_6 7189 *Bordetella bronchiseptica* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)

Figure 7B

1\_1\_1\_103 7706 *Yersinia pseudotuberculosis* THREONINE 3-DEHYDROGENASE (EC 1\_1\_1\_103)  
 1\_1\_1\_117 5819 *Saccharomyces cerevisiae* ARA1 D-ARABINOSE DEHYDROGENASE [NAD(P)+]  
 HEAVY CHAIN (EC 1\_1\_1\_117)  
 1\_1\_1\_122 1990 *Staphylococcus aureus* BS-yqkF D-threo-aldose 1-dehydrogenase (EC 1\_1\_1\_122)  
 1\_1\_1\_125 5491 *Yersinia pseudotuberculosis* EC-kduD 2-DEOXY-D-GLUCONATE 3-DEHYDROGENASE  
 (EC 1\_1\_1\_125)  
 1\_1\_1\_128 2873 *Salmonella typhimurium* idnD L-idonate 2-dehydrogenase (EC 1\_1\_1\_128)  
 1\_1\_1\_132 1698 *Pseudomonas aeruginosa* algD GDP-MANNOSE 6-DEHYDROGENASE (EC 1\_1\_1\_132)  
 1\_1\_1\_133 576 *Streptococcus pyogenes* rmlD DTDP-4-DEHYDRORHAMNOSE REDUCTASE (EC  
 1\_1\_1\_133)  
 1\_1\_1\_140 689 *Streptococcus mutans* str[Q9X671] SORBITOL-6-PHOSPHATE 2-DEHYDROGENASE (EC  
 1\_1\_1\_140)  
 1\_1\_1\_154 5678 *Salmonella typhimurium* UREIDOGLYCOLATE DEHYDROGENASE (EC 1\_1\_1\_154)  
 1\_1\_1\_157 2474 *Pseudomonas aeruginosa* PA1628 3-HYDROXYBUTYRYL-COA DEHYDROGENASE (EC  
 1\_1\_1\_157)  
 1\_1\_1\_158 6211 *Yersinia pseudotuberculosis* EC-murB UDP-N-ACETYLENOLPYRUVOYLGLUCOSAMINE  
 REDUCTASE (EC 1\_1\_1\_158)  
 1\_1\_1\_159 3149 *Mycobacterium tuberculosis* Rv3485c 7-ALPHA-HYDROXYSTEROID DEHYDROGENASE  
 (EC 1\_1\_1\_159)  
 1\_1\_1\_169 3121 *Yersinia pestis* EC-apbA 2-DEHYDROPANTOATE 2-REDUCTASE (EC 1\_1\_1\_169)  
 1\_1\_1\_17 2665 *Yersinia pestis* EC-mtlD MANNITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC 1\_1\_1\_17)  
 1\_1\_1\_179 6589 *Yersinia pseudotuberculosis* EC-ygjR TRANS-1,2-DIHYDROBENZENE-1,2-DIOL  
 DEHYDROGENASE (EC 1\_3\_1\_20) / D-xylose 1-dehydrogenase (NADP+) (EC 1\_1\_1\_179)  
 1\_1\_1\_18 6536 *Yersinia pseudotuberculosis* BS-yvaA MYO-INOSITOL 2-DEHYDROGENASE (EC  
 1\_1\_1\_18)  
 1\_1\_1\_193 4162 *Yersinia pseudotuberculosis* EC-ribD  
 DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-  
 (5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)  
 1\_1\_1\_195 3347 *Saccharomyces cerevisiae* YCR105W CINNAMYL-ALCOHOL DEHYDROGENASE (EC  
 1\_1\_1\_195)  
 1\_1\_1\_202 721 *Streptococcus pneumoniae* 1,3-PROPANEDIOL DEHYDROGENASE (EC 1\_1\_1\_202)  
 1\_1\_1\_215 7594 *Yersinia pseudotuberculosis* EC-yiaE gluconate 2-dehydrogenase (EC 1\_1\_1\_215)  
 1\_1\_1\_218 1521 *Staphylococcus aureus* MORPHINE 6-DEHYDROGENASE (EC 1\_1\_1\_218)  
 1\_1\_1\_23 7518 *Yersinia pseudotuberculosis* EC-hisD HISTIDINOL DEHYDROGENASE (EC 1\_1\_1\_23)  
 1\_1\_1\_233 5523 *Yersinia pseudotuberculosis* N-ACYLMANNOSAMINE 1-DEHYDROGENASE (EC  
 1\_1\_1\_233)  
 1\_1\_1\_236 4453 *Bordetella pertussis* TROPINONE REDUCTASE-II (EC 1\_1\_1\_236)  
 1\_1\_1\_24 246 *Neurospora crassa* qa-3 QUINATE 5-DEHYDROGENASE (EC 1\_1\_1\_24)  
 1\_1\_1\_244 1536 *Streptococcus pneumoniae* NAD-DEPENDENT METHANOL DEHYDROGENASE  
 (EC 1\_1\_1\_244)  
 1\_1\_1\_245 4533 *Mycobacterium tuberculosis* Rv0851c cyclohexanol dehydrogenase (EC 1\_1\_1\_245)  
 1\_1\_1\_25 5471 *Yersinia pseudotuberculosis* EC-aroE SHIKIMATE 5-DEHYDROGENASE (EC 1\_1\_1\_25)  
 1\_1\_1\_250 6682 *Yersinia pseudotuberculosis* D-ARABINITOL 2-DEHYDROGENASE (RIBULOSE  
 FORMING) (EC 1\_1\_1\_250)  
 1\_1\_1\_251 3106 *Salmonella typhi* GALACTITOL-1-PHOSPHATE 5-DEHYDROGENASE (EC  
 1\_1\_1\_251)  
 1\_1\_1\_28 6363 *Yersinia pseudotuberculosis* EC-ldhA D-LACTATE DEHYDROGENASE (EC 1\_1\_1\_28)  
 1\_1\_1\_29 6261 *Vibrio cholerae* El Tor N16961 ORF03166 GLYCERATE DEHYDROGENASE (EC 1\_1\_1\_29)  
 1\_1\_1\_3 6039 *Yersinia pseudotuberculosis* EC-metL ASPARTOKINASE II (EC 2\_7\_2\_4) / HOMOSERINE  
 DEHYDROGENASE II (EC 1\_1\_1\_3)  
 1\_1\_1\_31 7573 *Yersinia pseudotuberculosis* EC-yhaE 3-HYDROXYISOBUTYRATE DEHYDROGENASE  
 PRECURSOR (EC 1\_1\_1\_31)  
 1\_1\_1\_36 7197 *Vibrio cholerae* El Tor N16961 ORF00378 ACETOACETYL-COA REDUCTASE (EC  
 1\_1\_1\_36)  
 1\_1\_1\_38 4354 *Yersinia pestis* PUTATIVE MALATE OXIDOREDUCTASE (EC 1\_1\_1\_38)  
 1\_1\_1\_4 6406 *Yersinia pseudotuberculosis* 2,3-BUTANEDIOL DEHYDROGENASE (EC 1\_1\_1\_4)  
 1\_1\_1\_5 1649 *Streptococcus pyogenes* ACETOIN(DIACETYL) REDUCTASE (EC 1\_1\_1\_5)  
 1\_1\_1\_56 3415 *Klebsiella pneumoniae* RIBITOL 2-DEHYDROGENASE (EC 1\_1\_1\_56)  
 1\_1\_1\_57 6851 *Yersinia pseudotuberculosis* EC-yeiQ D-MANNONATE OXIDOREDUCTASE (EC 1\_1\_1\_57)



- 1\_1\_1\_58 7696 *Yersinia pseudotuberculosis* EC-uxaB ALTRONATE OXIDOREDUCTASE (EC 1\_1\_1\_58)  
 1\_1\_1\_6 6412 *Yersinia pseudotuberculosis* EC-gldA GLYCEROL DEHYDROGENASE (EC 1\_1\_1\_6)  
 1\_1\_1\_60 4592 *Salmonella typhimurium* yhaE 2-HYDROXY-3-OXOPROPIONATE REDUCTASE (EC 1\_1\_1\_60)  
 1\_1\_1\_61 6596 *Yersinia pseudotuberculosis* 4-hydroxybutyrate dehydrogenase (EC 1\_1\_1\_61)  
 1\_1\_1\_67 6339 *Saccharomyces cerevisiae* YEL070W MANNITOL 2-DEHYDROGENASE (EC 1\_1\_1\_67)  
 1\_1\_1\_69 6602 *Yersinia pseudotuberculosis* EC-yjgU GLUCONATE 5-DEHYDROGENASE (EC 1\_1\_1\_69)  
 1\_1\_1\_77 7794 *Yersinia pseudotuberculosis* LACTALDEHYDE REDUCTASE (EC 1\_1\_1\_77)  
 1\_1\_1\_81 6706 *Yersinia pseudotuberculosis* hydroxypyruvate reductase (EC 1\_1\_1\_81)  
 1\_1\_1\_82 2225 *Salmonella typhimurium* yiaK MALATE DEHYDROGENASE (EC 1\_1\_1\_37) (EC 1\_1\_1\_82)  
 1\_1\_1\_85 5094 *Yersinia pseudotuberculosis* 3-ISOPROPYLMALATE DEHYDROGENASE (EC 1\_1\_1\_85)  
 1\_1\_1\_86 5524 *Yersinia pseudotuberculosis* EC-ilvC KETOL-ACID REDUCTOISOMERASE (EC 1\_1\_1\_86)  
 1\_1\_1\_88 1236 *Streptococcus pyogenes* mvaS\_1 3-HYDROXY-3-METHYLGLUTARYL-COENZYME A REDUCTASE (EC 1\_1\_1\_88)  
 1\_1\_1\_9 7941 *Saccharomyces cerevisiae* YLR070C D-XYLULOSE REDUCTASE (EC 1\_1\_1\_9)  
 1\_1\_1\_90 8244 *Klebsiella pneumoniae* ARYL-ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_90)  
 1\_1\_1\_91 5043 *Salmonella paratyphi* ARYL-ALCOHOL DEHYDROGENASE (NADP+) (EC 1\_1\_1\_91)  
 1\_1\_1\_93 6131 *Yersinia pseudotuberculosis* BS-ycaA PROBABLE TARTRATE DEHYDROGENASE (EC 1\_1\_1\_93)  
 1\_1\_1\_94 271 *Yersinia pestis* EC-gpsA GLYCEROL-3-PHOSPHATE DEHYDROGENASE (NAD(P)+) (EC 1\_1\_1\_94)  
 1\_1\_2\_3 5868 *Yersinia pseudotuberculosis* EC-ldtD L-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_3)  
 1\_1\_2\_4 7485 *Vibrio cholerae* El Tor NI6961ORFA00737 D-LACTATE DEHYDROGENASE (CYTOCHROME) (EC 1\_1\_2\_4)  
 1\_1\_3\_24 5908 *Saccharomyces cerevisiae* ALO1 L-GALACTONOLACTONE OXIDASE (EC 1\_1\_3\_24) / D-ARABINONO-1,4-LACTONE OXIDASE (EC 1\_1\_3\_37)  
 1\_1\_3\_37 5908 *Saccharomyces cerevisiae* ALO1 L-GALACTONOLACTONE OXIDASE (EC 1\_1\_3\_24) / D-ARABINONO-1,4-LACTONE OXIDASE (EC 1\_1\_3\_37)  
 1\_1\_3\_6 1934 *Mycobacterium tuberculosis* choD CHOLESTEROL OXIDASE PRECURSOR (EC 1\_1\_3\_6)  
 1\_1\_3\_8 3056 *Mycobacterium tuberculosis* Rv3790 L-GULONOLACTONE OXIDASE (EC 1\_1\_3\_8)  
 1\_1\_3\_9 4256 *Clostridium acetobutylicum* GALACTOSE OXIDASE PRECURSOR (EC 1\_1\_3\_9)  
 1\_1\_99\_10 20148 *Neurospora crassa* GLUCOSE DEHYDROGENASE (ACCEPTOR) PRECURSOR (EC 1\_1\_99\_10)  
 1\_1\_99\_16 1142 *Staphylococcus aureus* MALATE:QUINONE OXIDOREDUCTASE (EC 1\_1\_99\_16)  
 1\_1\_99\_17 3487 *Salmonella typhimurium* yliI GLUCOSE DEHYDROGENASE-B (PYRROLOQUINOLINE-QUINONE) PRECURSOR (EC 1\_1\_99\_17)  
 1\_1\_99\_21 8182 *Pseudomonas aeruginosa* PA4571 sorbitol dehydrogenase, cytochrome c subunit (EC 1\_1\_99\_21)  
 1\_1\_99\_25 6023 *Yersinia pseudotuberculosis* BS-yhfK quinate dehydrogenase (pyrroloquinoline-quinone) (EC 1\_1\_99\_25)  
 1\_1\_99\_28 3781 *Yersinia pestis* GLUCOSE--FRUCTOSE OXIDOREDUCTASE PRECURSOR (EC 1\_1\_99\_28)  
 1\_1\_99\_3 2248 *Pseudomonas aeruginosa* PA2266 gluconate 2-dehydrogenase, cytochrome c subunit (EC 1\_1\_99\_3)  
 1\_1\_99\_8 5086 *Pseudomonas aeruginosa* exaA ALCOHOL DEHYDROGENASE [ACCEPTOR] PRECURSOR (EC 1\_1\_99\_8)  
 1\_10\_3\_2 5230 *Yersinia pseudotuberculosis* EC-yacK LACCASE I PRECURSOR (EC 1\_10\_3\_2)  
 1\_10\_99\_1 264 *Rickettsia prowazekii* RP270 CYTOCHROME B6-F COMPLEX IRON-SULFUR SUBUNIT (EC 1\_10\_99\_1)  
 1\_11\_1\_1 1506 *Streptococcus pyogenes* NADH PEROXIDASE (EC 1\_11\_1\_1)  
 1\_11\_1\_10 5676 *Salmonella typhimurium* NON-HEME CHLOROPEROXIDASE (EC 1\_11\_1\_10)  
 1\_11\_1\_5 5289 *Yersinia pseudotuberculosis* EC-yhjA CYTOCHROME C551 PEROXIDASE PRECURSOR (EC 1\_11\_1\_5)  
 1\_12\_1\_2 12 *Clostridium difficile* NAD-REDUCING HYDROGENASE HOXS ALPHA SUBUNIT (EC 1\_12\_1\_2)  
 1\_12\_99\_1 1065 *Clostridium difficile* COENZYME F420 HYDROGENASE BETA SUBUNIT (EC 1\_12\_99\_1)  
 1\_12\_99\_3 65 *Helicobacter pylori* HP0631 QUINONE-REACTIVE NI/FE-HYDROGENASE SMALL CHAIN PRECURSOR (EC 1\_12\_99\_3)

1\_13\_11\_1 257 *Pseudomonas aeruginosa* catA CATECHOL 1,2-DIOXYGENASE (EC 1\_13\_11\_1)  
 1\_13\_11\_2 5927 *Pseudomonas aeruginosa* PA3503 METAPYROCATECHASE (EC 1\_13\_11\_2)  
 1\_13\_11\_3 387 *Rickettsia prowazekii* RP396 PROTOCATECHUATE 3,4-DIOXYGENASE BETA CHAIN  
 (EC 1\_13\_11\_3)  
 1\_13\_11\_4 3418 *Salmonella typhimurium* GENTISATE 1,2-DIOXYGENASE (EC 1\_13\_11\_4)  
 1\_13\_11\_8 1438 *Klebsiella pneumoniae* PROTOCATECHUATE 4,5-DIOXYGENASE BETA CHAIN  
 (EC 1\_13\_11\_8)  
 1\_14\_12\_1 2526 *Pseudomonas aeruginosa* antA ANTHRANILATE DIOXYGENASE LARGE SUBUNIT  
 (EC 1\_14\_12\_1)  
 1\_14\_12\_3 3775 *Mycobacterium tuberculosis* Rv3161c BENZENE 1,2-DIOXYGENASE ALPHA SUBUNIT  
 (EC 1\_14\_12\_3)  
 1\_14\_13\_1 3165 *Staphylococcus aureus* SALICYLATE HYDROXYLASE (EC 1\_14\_13\_1)  
 1\_14\_13\_2 1552 *Pseudomonas aeruginosa* pobA P-HYDROXYBENZOATE HYDROXYLASE (EC  
 1\_14\_13\_2)  
 1\_14\_13\_3 4819 *Yersinia pseudotuberculosis* 4-HYDROXYPHENYLACETATE 3-MONOOXYGENASE  
 (EC 1\_14\_13\_3)  
 1\_14\_13\_7 3305 *Clostridium difficile* PHENOL HYDROXYLASE P5 PROTEIN (EC 1\_14\_13\_7)  
 1\_14\_14\_3 7523 *Yersinia pseudotuberculosis* EC-yhbW ALKANAL MONOOXYGENASE ALPHA CHAIN  
 (EC 1\_14\_14\_3)  
 1\_14\_99\_6 2999 *Mycobacterium tuberculosis* desA1 ACYL-[ACYL-CARRIER PROTEIN] DESATURASE  
 PRECURSOR (EC 1\_14\_99\_6)  
 1\_16\_1\_1 480 *Streptococcus pneumoniae* EC-ykgC MERCURIC REDUCTASE (EC 1\_16\_1\_1)  
 1\_2\_1\_10 5050 *Yersinia pestis* EC-yiaY ALCOHOL DEHYDROGENASE (EC 1\_1\_1\_1)/ ACETALDEHYDE  
 DEHYDROGENASE (ACETYLATING) (EC 1\_2\_1\_10)/ PYRUVATE-FORMATE-LYASE DEACTIVASE  
 1\_2\_1\_11 4156 *Yersinia pseudotuberculosis* ASPARTATE-SEMIALDEHYDE DEHYDROGENASE (EC  
 1\_2\_1\_11)  
 1\_2\_1\_2 6935 *Yersinia pseudotuberculosis* EC-fdhF FORMATE DEHYDROGENASE ALPHA CHAIN (EC  
 1\_2\_1\_2)  
 1\_2\_1\_22 5616 *Vibrio cholerae* El Tor N16961 ORF02302 ALDEHYDE DEHYDROGENASE B (EC  
 1\_2\_1\_22)  
 1\_2\_1\_38 7307 *Yersinia pseudotuberculosis* EC-argC N-ACETYL-GAMMA-GLUTAMYL-PHOSPHATE  
 REDUCTASE (EC 1\_2\_1\_38)  
 1\_2\_1\_39 8343 *Pseudomonas aeruginosa* PA4073 PHENYLACETALDEHYDE DEHYDROGENASE (EC  
 1\_2\_1\_39)  
 1\_2\_1\_46 8076 *Pseudomonas aeruginosa* fdhA GLUTATHIONE-INDEPENDENT FORMALDEHYDE  
 DEHYDROGENASE (EC 1\_2\_1\_46)  
 1\_2\_1\_9 502 *Ureaplasma urealyticum* UU362 NADP-DEPENDENT GLYCERALDEHYDE-3-PHOSPHATE  
 DEHYDROGENASE (EC 1\_2\_1\_9)  
 1\_2\_2\_2 6213 *Yersinia pseudotuberculosis* EC-poxB PYRUVATE DEHYDROGENASE (CYTOCHROME)  
 (EC 1\_2\_2\_2)  
 1\_2\_2\_4 3880 *Mycobacterium tuberculosis* Rv0375c CARBON MONOXIDE OXYGENASE [CYTOCHROME  
 B-561], MEDIUM CHAIN (EC 1\_2\_2\_4)  
 1\_2\_3\_3 904 *Streptococcus pneumoniae* EC-poxB PYRUVATE OXIDASE (EC 1\_2\_3\_3)  
 1\_2\_7\_1 1920 *Staphylococcus aureus* PYRUVATE SYNTHASE SUBUNIT PORB (EC 1\_2\_7\_1)  
 1\_2\_99\_2 3882 *Mycobacterium tuberculosis* Rv0373c CARBON MONOXIDE DEHYDROGENASE ALPHA  
 SUBUNIT (EC 1\_2\_99\_2)  
 1\_2\_99\_3 2737 *Pseudomonas aeruginosa* PA1880 MEMBRANE-BOUND ALDEHYDE DEHYDROGENASE  
 (PYRROLOQUINOLINE-QUINONE) (EC 1\_2\_99\_3)  
 1\_3\_1\_10 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES:  
 EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]  
 1\_3\_1\_12 6916 *Yersinia pseudotuberculosis* EC-tyrA CHORISMATE MUTASE (EC 5\_4\_99\_5)/  
 PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_26 5250 *Yersinia pseudotuberculosis* EC-dapB DIHYDRODIPICOLINATE REDUCTASE (EC  
 1\_3\_1\_26)  
 1\_3\_1\_28 5065 *Yersinia pseudotuberculosis* 2,3-DIHYDRO-2,3-DIHYDROXYBENZOATE  
 DEHYDROGENASE (EC 1\_3\_1\_28)  
 1\_3\_1\_31 211 *Clostridium acetobutylicum* 4803135\_F3\_74 2-ENOATE REDUCTASE (EC 1\_3\_1\_31)  
 1\_3\_1\_33 2343 *Mycobacterium tuberculosis* Rv0303 PROTOCHLOROPHYLLIDE REDUCTASE  
 PRECURSOR (EC 1\_3\_1\_33)  
 1\_3\_1\_43 388 *Streptococcus pneumoniae* EC-tyrA AROGENATE DEHYDROGENASE (EC 1\_3\_1\_43)/  
 PREPHENATE DEHYDROGENASE (EC 1\_3\_1\_12)  
 1\_3\_1\_54 976 *Salmonella typhimurium* sp|Q05591 PRECORRIN-6X REDUCTASE (EC 1\_3\_1\_54)

1\_3\_1\_55 4285 *Pseudomonas aeruginosa* xylL CIS-1,2-DIHYDROXYCYCLOHEXA-3,5-DIENE-1-CARBOXYLATE DEHYDROGENASE (EC 1\_3\_1\_55)  
 1\_3\_1\_6 450 *Streptococcus mutans* fumarate reductase (NADH) (EC 1\_3\_1\_6)  
 1\_3\_1\_9 73 *Streptococcus pyogenes* fabK ENOYL-[ACYL-CARRIER PROTEIN] REDUCTASE (NADH) (EC 1\_3\_1\_9)  
 1\_3\_99\_16 827 *Pseudomonas aeruginosa* PA1602 ISOQUINOLINE 1-OXIDOREDUCTASE ALPHA SUBUNIT (EC 1\_3\_99\_16)  
 1\_3\_99\_4 6227 *Pseudomonas aeruginosa* PA2243 3-OXOSTEROID 1-DEHYDROGENASE (EC 1\_3\_99\_4)  
 1\_4\_1\_1 5701 *Vibrio cholerae* El Tor N16961 ORF02403 ALANINE DEHYDROGENASE (EC 1\_4\_1\_1)  
 1\_4\_1\_13 7734 *Yersinia pseudotuberculosis* EC-gltB GLUTAMATE SYNTHASE [NADPH] LARGE CHAIN (EC 1\_4\_1\_13)  
 1\_4\_1\_16 523 *Porphyromonas gingivalis* MESO-DIAMINOPIMELATE D-DEHYDROGENASE (EC 1\_4\_1\_16)  
 1\_4\_1\_2 5304 *Vibrio cholerae* El Tor N16961 ORF01910 NAD-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_2)  
 1\_4\_1\_4 2029 *Yersinia pestis* EC-gdhA NADP-SPECIFIC GLUTAMATE DEHYDROGENASE (EC 1\_4\_1\_4)  
 1\_4\_1\_9 5327 *Pseudomonas aeruginosa* ldh LEUCINE DEHYDROGENASE (EC 1\_4\_1\_9)  
 1\_4\_3\_16 6756 *Yersinia pseudotuberculosis* EC-nadB L-ASPARTATE OXIDASE (EC 1\_4\_3\_16)  
 1\_4\_3\_2 1900 *Bacillus subtilis* yobN L-AMINO ACID OXIDASE (EC 1\_4\_3\_2)  
 1\_4\_7\_1 6140 *Vibrio cholerae* El Tor N16961 ORF03003 FERREDOXIN-DEPENDENT GLUTAMATE SYNTHASE 1 (EC 1\_4\_7\_1)  
 1\_4\_99\_1 5331 *Yersinia pseudotuberculosis* EC-dadA D-AMINO ACID DEHYDROGENASE SMALL SUBUNIT (EC 1\_4\_99\_1)  
 1\_5\_1\_19 57 *Pseudomonas aeruginosa* hcnB D-nopaline dehydrogenase (EC 1\_5\_1\_19)  
 1\_5\_1\_28 1247 *Staphylococcus aureus* OPINE DEHYDROGENASE (EC 1\_5\_1\_28)  
 1\_5\_1\_7 284 *Saccharomyces cerevisiae* LYS1 SACCHAROPINE DEHYDROGENASE (NAD<sup>+</sup>, L-LYSINE FORMING) (EC 1\_5\_1\_7)  
 1\_5\_3\_1 216 *Yersinia pestis* SARCOSINE OXIDASE (EC 1\_5\_3\_1)  
 1\_5\_3\_6 1593 *Yersinia pestis* 6-HYDROXY-D-NICOTINE OXIDASE (EC 1\_5\_3\_6)  
 1\_5\_99\_2 2270 *Pseudomonas aeruginosa* PA5309 DIMETHYLGLYCINE DEHYDROGENASE (EC 1\_5\_99\_2)  
 1\_5\_99\_4 20548 *Neurospora crassa* NICOTINE DEHYDROGENASE (EC 1\_5\_99\_4)  
 1\_5\_99\_8 7719 *Yersinia pseudotuberculosis* EC-putA PROLINE DEHYDROGENASE (EC 1\_5\_99\_8) / DELTA-1-PYRROLINE-5-CARBOXYLATE DEHYDROGENASE (EC 1\_5\_1\_12)  
 1\_5\_99\_9 825 *Mycobacterium tuberculosis* Rv2951c F420-DEPENDENT METHYLENETETRAHYDROMETHANOPTERIN DEHYDROGENASE (EC 1\_5\_99\_9)  
 1\_6\_1\_1 2656 *Salmonella enteritidis* SOLUBLE PYRIDINE NUCLEOTIDE TRANSHYDROGENASE (EC 1\_6\_1\_1)  
 1\_6\_6\_1 2837 *Salmonella typhimurium* NITRATE REDUCTASE (EC 1\_6\_6\_1)  
 1\_6\_6\_3 7493 *Yersinia pseudotuberculosis* NITRATE REDUCTASE (NADPH) (EC 1\_6\_6\_3)  
 1\_6\_6\_4 7870 *Yersinia pseudotuberculosis* EC-nirD NITRITE REDUCTASE (NAD(P)H) SMALL SUBUNIT (EC 1\_6\_6\_4)  
 1\_6\_6\_9 5490 *Vibrio cholerae* El Tor N16961 ORF02162 TRIMETHYLAMINE-N-OXIDE REDUCTASE PRECURSOR (EC 1\_6\_6\_9)  
 1\_6\_8\_1 5170 *Yersinia pestis* NADH-DEPENDENT FMN REDUCTASE (EC 1\_6\_8\_1)  
 1\_7\_7\_1 590 *Mycobacterium tuberculosis* nirA FERREDOXIN--NITRITE REDUCTASE (EC 1\_7\_7\_1)  
 1\_7\_99\_4 7910 *Yersinia pseudotuberculosis* EC-napA PERIPLASMIC NITRATE REDUCTASE PRECURSOR (EC 1\_7\_99\_4)  
 1\_7\_99\_5 6038 *Yersinia pseudotuberculosis* EC-metF 5,10-METHYLENETETRAHYDROFOLATE REDUCTASE (EC 1\_7\_99\_5)  
 1\_7\_99\_6 356 *Pseudomonas aeruginosa* nosZ NITROUS-OXIDE REDUCTASE (EC 1\_7\_99\_6)  
 1\_7\_99\_7 1406 *Pseudomonas aeruginosa* norB NITRIC-OXIDE REDUCTASE SUBUNIT B (EC 1\_7\_99\_7)  
 1\_8\_1\_2 4928 *Yersinia pseudotuberculosis* SULFITE REDUCTASE (NADPH) FLAVOPROTEIN ALPHA-COMPONENT (EC 1\_8\_1\_2)  
 1\_8\_7\_1 6122 *Saccharomyces cerevisiae* ECM17 SULFITE REDUCTASE (FERREDOXIN) (EC 1\_8\_7\_1)  
 1\_8\_99\_2 5628 *Pseudomonas aeruginosa* PA2298 ADENYLYL-SULPHATE REDUCTASE ALFA-SUBUNIT (EC 1\_8\_99\_2)  
 1\_8\_99\_3 3722 *Yersinia pestis* EC-yccK SULFITE REDUCTASE, DISSIMILATORY-TYPE GAMMA SUBUNIT (EC 1\_8\_99\_3)  
 1\_9\_3\_2 1909 *Pseudomonas aeruginosa* nirS NITRITE REDUCTASE PRECURSOR (EC 1\_9\_3\_2)  
 2\_1\_1\_10 252 *Escherichia coli* yagD HOMOCYSTEINE S-METHYLTRANSFERASE (EC 2\_1\_1\_10)

2\_1\_1\_100 2200 *Saccharomyces cerevisiae* STE14 PROTEIN-S ISOPRENYLCYSTEINE O-METHYLTRANSFERASE (EC 2\_1\_1\_100)  
 2\_1\_1\_104 703 *Streptococcus pyogenes* BS-*yrpM* CAFFEOYL-COA O-METHYLTRANSFERASE (EC 2\_1\_1\_104)  
 2\_1\_1\_107 6879 *Yersinia pseudotuberculosis* EC-*hemX* PUTATIVE UROPORPHYRIN-III C-METHYLTRANSFERASE (EC 2\_1\_1\_107)  
 2\_1\_1\_113 6162 *Yersinia pseudotuberculosis* MODIFICATION METHYLASE CFR9I (EC 2\_1\_1\_113)  
 2\_1\_1\_114 1883 *Saccharomyces cerevisiae* COQ3 HEXAPRENYLDIHYDROXYBENZOATE METHYLTRANSFERASE PRECURSOR (EC 2\_1\_1\_114)  
 2\_1\_1\_130 978 *Salmonella typhimurium* *cblL* PRECORRIN-2 C20-METHYLTRANSFERASE (EC 2\_1\_1\_130)  
 2\_1\_1\_131 975 *Salmonella typhimurium* *cblH* PRECORRIN-3B C17-METHYLTRANSFERASE (EC 2\_1\_1\_131)  
 2\_1\_1\_132 971 *Salmonella typhimurium* *cblE* PRECORRIN-6Y C5,15-METHYLTRANSFERASE (DECARBOXYLATING) (EC 2\_1\_1\_132)  
 2\_1\_1\_133 973 *Salmonella typhimurium* *cblF* PRECORRIN-4 C11-METHYLTRANSFERASE (EC 2\_1\_1\_133)  
 2\_1\_1\_14 5982 *Yersinia pseudotuberculosis* 5-METHYLTETRAHYDROPTEROYLTRIGLUTAMATE--HOMOCYSTEINE METHYLTRANSFERASE (EC 2\_1\_1\_14)  
 2\_1\_1\_16 2534 *Saccharomyces cerevisiae* OPI3 METHYLENE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_16)  
 2\_1\_1\_34 7362 *Yersinia pseudotuberculosis* EC-*spoU* TRNA (GUANOSINE-2'-O-) -METHYLTRANSFERASE (EC 2\_1\_1\_34)  
 2\_1\_1\_35 7315 *Yersinia pseudotuberculosis* TRNA (URACIL-5-) -METHYLTRANSFERASE (EC 2\_1\_1\_35)  
 2\_1\_1\_41 4901 *Saccharomyces cerevisiae* ERG6 DELTA(24)-STEROL C-METHYLTRANSFERASE (EC 2\_1\_1\_41)  
 2\_1\_1\_48 841 *Staphylococcus aureus* RRNA ADENINE N-6-METHYLTRANSFERASE (EC 2\_1\_1\_48)  
 2\_1\_1\_51 5798 *Vibrio cholerae* El Tor N16961 ORF02531 RRNA (GUANINE-N1-) -METHYLTRANSFERASE (EC 2\_1\_1\_51)  
 2\_1\_1\_52 6485 *Yersinia pseudotuberculosis* EC-*yjyT* RIBOSOMAL RNA SMALL SUBUNIT METHYLTRANSFERASE C (EC 2\_1\_1\_52)  
 2\_1\_1\_64 5749 *Yersinia pseudotuberculosis* EC-*ubiG* 3-DEMETHYLUBIQUINONE-9 3-METHYLTRANSFERASE (EC 2\_1\_1\_64)  
 2\_1\_1\_72 5839 *Yersinia pseudotuberculosis* DNA ADENINE METHYLASE (EC 2\_1\_1\_72)  
 2\_1\_1\_79 4807 *Yersinia pseudotuberculosis* CYCLOPROPANE-FATTY-ACYL-PHOSPHOLIPID SYNTHASE (EC 2\_1\_1\_79)  
 2\_1\_1\_98 3344 *Saccharomyces cerevisiae* DPH5 DIPHTHINE SYNTHASE (EC 2\_1\_1\_98)  
 2\_1\_2\_11 7188 *Yersinia pseudotuberculosis* EC-*panB* 3-METHYL-2-OXOBUTANOATE HYDROXYMETHYLTRANSFERASE (EC 2\_1\_2\_11)  
 2\_1\_2\_9 7323 *Yersinia pseudotuberculosis* METHIONYL-TRNA FORMYLTRANSFERASE (EC 2\_1\_2\_9)  
 2\_1\_3\_1 72 *Streptococcus equi* BIOTIN CARBOXYL CARRIER PROTEIN OF METHYLMALONYL-COA CARBOXYL-TRANSFERASE (EC 2\_1\_3\_1)  
 2\_1\_3\_5 6612 *Salmonella typhimurium* *glxB6* oxamate carbamoyltransferase (EC 2\_1\_3\_5)  
 2\_3\_1\_109 6580 *Yersinia pseudotuberculosis* ARGININE N-SUCCINYLTRANSFERASE, BETA CHAIN (EC 2\_3\_1\_109)  
 2\_3\_1\_117 6549 *Yersinia pseudotuberculosis* EC-*dapD* 2,3,4,5-TETRAHYDROPYRIDINE-2-CARBOXYLATE N-SUCCINYLTRANSFERASE (EC 2\_3\_1\_117)  
 2\_3\_1\_129 4319 *Yersinia pseudotuberculosis* EC-*lpxA* ACYL-[ACYL-CARRIER-PROTEIN]--UDP-N-ACETYLGLUCOSAMINE O-ACYLTRANSFERASE (EC 2\_3\_1\_129)  
 2\_3\_1\_15 7483 *Yersinia pseudotuberculosis* EC-*plsB* GLYCEROL-3-PHOSPHATE ACYLTRANSFERASE (EC 2\_3\_1\_15)  
 2\_3\_1\_18 3394 *Staphylococcus aureus* BS-*yyl* GALACTOSIDE O-ACETYLTRANSFERASE (EC 2\_3\_1\_18)  
 2\_3\_1\_19 107 *Rickettsia prowazekii* RP109 PHOSPHATE BUTYRYLTRANSFERASE (EC 2\_3\_1\_19)  
 2\_3\_1\_28 6768 *Vibrio cholerae* El Tor N16961 ORFA01206 CHLORAMPHENICOL ACETYLTRANSFERASE (EC 2\_3\_1\_28)  
 2\_3\_1\_30 6922 *Yersinia pseudotuberculosis* EC-*cysE* SERINE ACETYLTRANSFERASE (EC 2\_3\_1\_30)  
 2\_3\_1\_31 1111 *Staphylococcus aureus* HOMOSERINE O-ACETYLTRANSFERASE (EC 2\_3\_1\_31)  
 2\_3\_1\_35 1663 *Streptococcus mutans* BS-*argJ* GLUTAMATE N-ACETYLTRANSFERASE (EC 2\_3\_1\_35) / AMINO-ACID ACETYLTRANSFERASE (EC 2\_3\_1\_1)

- 2\_3\_1\_38 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3-HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]
- 2\_3\_1\_41 4420 *Yersinia pseudotuberculosis* EC-fabH 3-OXOACYL-[ACYL-CARRIER-PROTEIN] SYNTHASE III (EC 2\_3\_1\_41)
- 2\_3\_1\_46 6404 *Yersinia pseudotuberculosis* EC-metA HOMOSERINE O-SUCCINYLTRANSFERASE (EC 2\_3\_1\_46)
- 2\_3\_1\_47 7844 *Yersinia pseudotuberculosis* EC-bioF 8-AMINO-7-OXONONANOATE SYNTHASE (EC 2\_3\_1\_47)
- 2\_3\_1\_54 6846 *Yersinia pseudotuberculosis* EC-pflB FORMATE ACETYLTRANSFERASE I (EC 2\_3\_1\_54)
- 2\_3\_1\_74 699 *Mycobacterium tuberculosis* pks18 CHALCONE SYNTHASE 2 (EC 2\_3\_1\_74)
- 2\_3\_1\_79 7342 *Vibrio cholerae* El Tor N16961ORFA00562 PROBABLE MALTOSE O-ACETYLTRANSFERASE (EC 2\_3\_1\_79)
- 2\_3\_1\_8 7412 *Yersinia pseudotuberculosis* PHOSPHATE ACETYLTRANSFERASE (EC 2\_3\_1\_8)
- 2\_3\_1\_81 2161 *Bacillus subtilis* yokD AMINOGLYCOSIDE N<sup>3</sup>-ACETYLTRANSFERASE III (EC 2\_3\_1\_81)
- 2\_3\_1\_82 407 *Klebsiella pneumoniae* spP19650 AMINOGLYCOSIDE N<sup>6</sup>-ACETYLTRANSFERASE (EC 2\_3\_1\_82)
- 2\_3\_1\_84 7847 *Saccharomyces cerevisiae* ATF2 ALCOHOL O-ACETYLTRANSFERASE 2 (EC 2\_3\_1\_84)
- 2\_3\_1\_85 3198 *Mycobacterium tuberculosis* fas FATTY ACID SYNTHASE (EC 2\_3\_1\_85) [INCLUDES: EC 2\_3\_1\_38; EC 2\_3\_1\_39; EC 2\_3\_1\_41; EC 1\_1\_1\_100; EC 4\_2\_1\_61; EC 1\_3\_1\_10; EC 3\_1\_2\_14]
- 2\_3\_1\_86 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3-HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]
- 2\_3\_1\_88 3462 *Saccharomyces cerevisiae* NAT2 N-TERMINAL ACETYLTRANSFERASE 2 (EC 2\_3\_1\_88)
- 2\_3\_1\_94 3094 *Bordetella pertussis* ERYTHRONOLIDE SYNTHASE, MODULES 1 AND 2 (EC 2\_3\_1\_94)
- 2\_4\_1\_10 84 *Streptococcus mutans* BS-sacB LEVANSUCRASE PRECURSOR (EC 2\_4\_1\_10)
- 2\_4\_1\_109 2513 *Saccharomyces cerevisiae* YDR307W DOLICHYL-PHOSPHATE-MANNOSE--PROTEIN MANNOSYLTRANSFERASE 7 (EC 2\_4\_1\_109)
- 2\_4\_1\_12 2745 *Salmonella typhi* CELLULOSE SYNTHASE (EC 2\_4\_1\_12)
- 2\_4\_1\_131 178 *Saccharomyces cerevisiae* KRE2 GLYCOLIPID 2-ALPHA-MANNOSYLTRANSFERASE (EC 2\_4\_1\_131)
- 2\_4\_1\_15 4715 *Salmonella typhimurium* otsA ALPHA,ALPHA-TREHALOSE-PHOSPHATE SYNTHASE (UDP-FORMING) (EC 2\_4\_1\_15)
- 2\_4\_1\_157 1170 *Streptococcus pyogenes* BS-ypjH 1,2-DIACYLGLYCEROL 3-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_157)
- 2\_4\_1\_16 3550 *Saccharomyces cerevisiae* CHS3 CHITIN SYNTHASE 3 (EC 2\_4\_1\_16)
- 2\_4\_1\_182 4488 *Yersinia pseudotuberculosis* EC-lpxB LIPID-A-DISACCHARIDE SYNTHASE (EC 2\_4\_1\_182)
- 2\_4\_1\_19 2204 *Clostridium acetobutylicum* 19539818\_C3\_34 CYCLOMALTODEXTRIN GLUCANOTRANSFERASE (EC 2\_4\_1\_19)
- 2\_4\_1\_20 554 *Clostridium acetobutylicum* 3126303\_C3\_47 CELLOBIOSE-PHOSPHORYLASE (EC 2\_4\_1\_20)
- 2\_4\_1\_21 5634 *Yersinia pseudotuberculosis* EC-glga GLYCOGEN SYNTHASE (EC 2\_4\_1\_21)
- 2\_4\_1\_25 6960 *Yersinia pseudotuberculosis* EC-malQ 4-ALPHA-GLUCANOTRANSFERASE (EC 2\_4\_1\_25)
- 2\_4\_1\_33 1699 *Pseudomonas aeruginosa* PA3541 GLUCOSYL TRANSFERASE [probable ALGINATE SYNTHASE (EC 2\_4\_1\_33)]
- 2\_4\_1\_34 982 *Saccharomyces cerevisiae* FKS3 PUTATIVE 1,3-BETA-GLUCAN SYNTHASE COMPONENT (EC 2\_4\_1\_34)
- 2\_4\_1\_44 629 *Streptococcus pneumoniae* LIPOPOLYSACCHARIDE 1,3-GALACTOSYLTRANSFERASE (EC 2\_4\_1\_44)
- 2\_4\_1\_5 218 *Streptococcus pneumoniae* GLUCOSYLTRANSFERASE-S (EC 2\_4\_1\_5)
- 2\_4\_1\_52 642 *Streptococcus pneumoniae* PROBABLE POLY(GLYCEROL-PHOSPHATE) ALPHA-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_52)

- 2\_4\_1\_56 782 *Salmonella typhimurium* waaK LIPOPOLYSACCHARIDE 1,2-N-ACETYLGLUCOSAMINETRANSFERASE (EC 2\_4\_1\_56)
- 2\_4\_1\_58 537 *Streptococcus mutans* LIPOPOLYSACCHARIDE 1,2-GLUCOSYLTRANSFERASE (EC 2\_4\_1\_58)
- 2\_4\_1\_8 960 *Neisseria gonorrhoeae* BS-yvdK maltose phosphorylase (EC 2\_4\_1\_8)
- 2\_4\_2\_17 7517 *Yersinia pseudotuberculosis* EC-hisG ATP PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_17)
- 2\_4\_2\_18 8101 *Yersinia pseudotuberculosis* EC-ybiB ANTHRANILATE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_18)
- 2\_4\_2\_2 1031 *Streptococcus pneumoniae* EC-deoA PYRIMIDINE-NUCLEOSIDE PHOSPHORYLASE (EC 2\_4\_2\_2)
- 2\_4\_2\_21 5062 *Vibrio cholerae* El Tor N16961 ORF01605 NICOTINATE-NUCLEOTIDE--DIMETHYLBENZIMIDAZOLE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_21)
- 2\_4\_2\_22 6051 *Vibrio cholerae* El Tor N16961 ORF02888 XANTHINE-GUANINE PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_22)
- 2\_4\_2\_36 692 *Vibrio cholerae* El Tor N16961 ORF01870 CHOLERA ENTEROTOXIN, A CHAIN PRECURSOR (NAD(+)--DIPHTHAMIDE ADP- RIBOSYLTRANSFERASE) (EC 2\_4\_2\_36)
- 2\_4\_2\_9 7828 *Yersinia pseudotuberculosis* URACIL PHOSPHORIBOSYLTRANSFERASE (EC 2\_4\_2\_9)
- 2\_5\_1\_15 5500 *Yersinia pseudotuberculosis* DIHYDROPTEROATE SYNTHASE (EC 2\_5\_1\_15)
- 2\_5\_1\_17 6704 *Yersinia pseudotuberculosis* EC-btuR COB(I)ALAMIN ADENOSYLTRANSFERASE (EC 2\_5\_1\_17)
- 2\_5\_1\_19 5267 *Yersinia pseudotuberculosis* EC-aroA 3-PHOSPHOSHIKIMATE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_19)
- 2\_5\_1\_29 7442 *Yersinia pseudotuberculosis* EC-ispA FARNESYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_1)/GERANYLTRANSTRANSFERASE (EC 2\_5\_1\_10); GERANYLGERANYL PYROPHOSPHATE SYNTHASE (EC 2\_5\_1\_29)
- 2\_5\_1\_3 8137 *Yersinia pseudotuberculosis* EC-thiE THIAMIN-PHOSPHATE PYROPHOSPHORYLASE (EC 2\_5\_1\_3)
- 2\_5\_1\_30 121 *Enterococcus faecium* (DOE) HEPTAPRENYL DIPHOSPHATE SYNTHASE COMPONENT I (EC 2\_5\_1\_30)
- 2\_5\_1\_31 970 *Yersinia pestis* BS-yluA UNDECAPRENYL PYROPHOSPHATE SYNTHETASE (EC 2\_5\_1\_31)
- 2\_5\_1\_7 7299 *Yersinia pseudotuberculosis* EC-murA UDP-N-ACETYLGLUCOSAMINE 1-CARBOXYVINYLTRANSFERASE (EC 2\_5\_1\_7)
- 2\_5\_1\_8 7219 *Yersinia pseudotuberculosis* EC-miaA TRNA DELTA(2)-ISOPENTENYLPYROPHOSPHATE TRANSFERASE (EC 2\_5\_1\_8)
- 2\_5\_1\_9 4806 *Yersinia pseudotuberculosis* EC-ribE RIBOFLAVIN SYNTHASE ALPHA CHAIN (EC 2\_5\_1\_9)
- 2\_6\_1\_11 5216 *Yersinia pseudotuberculosis* ACETYLORNITHINE AMINOTRANSFERASE (EC 2\_6\_1\_11)
- 2\_6\_1\_17 825 *Bordetella pertussis* BS-ykrV N-SUCCINYL-L,L-DAP AMINOTRANSFERASE (EC 2\_6\_1\_17)
- 2\_6\_1\_18 3304 *Pseudomonas aeruginosa* PA5313 OMEGA-AMINO ACID--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_18)
- 2\_6\_1\_21 906 *Staphylococcus aureus* trjQ9KWZ6 D-ALANINE AMINOTRANSFERASE (EC 2\_6\_1\_21)
- 2\_6\_1\_36 2852 *Mycobacterium tuberculosis* lat L-LYSINE-EPSILON AMINOTRANSFERASE (EC 2\_6\_1\_36)
- 2\_6\_1\_37 7110 *Vibrio cholerae* El Tor N16961ORFA00272 (2-aminoethyl)phosphonate--pyruvate transaminase (EC 2\_6\_1\_37)
- 2\_6\_1\_46 7330 *Vibrio cholerae* El Tor N16961ORFA00548 DIAMINO BUTYRATE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_46)
- 2\_6\_1\_52 5066 *Yersinia pseudotuberculosis* PHOSPHOSERINE AMINOTRANSFERASE (EC 2\_6\_1\_52)
- 2\_6\_1\_57 7907 *Yersinia pseudotuberculosis* EC-tyrB AROMATIC-AMINO-ACID AMINOTRANSFERASE (EC 2\_6\_1\_57)
- 2\_6\_1\_62 6402 *Yersinia pseudotuberculosis* EC-bioA ADENOSYLMETHIONINE-8-AMINO-7-OXONONANOATE AMINOTRANSFERASE (EC 2\_6\_1\_62)
- 2\_6\_1\_66 5309 *Yersinia pseudotuberculosis* EC-avtA VALINE--PYRUVATE AMINOTRANSFERASE (EC 2\_6\_1\_66)
- 2\_6\_1\_9 7519 *Yersinia pseudotuberculosis* EC-hisC HISTIDINOL-PHOSPHATE AMINOTRANSFERASE (EC 2\_6\_1\_9)
- 2\_7\_1\_108 6646 *Saccharomyces cerevisiae* SEC59 DOLICHOL KINASE (EC 2\_7\_1\_108)

- 2\_7\_1\_116 7358 *Yersinia pseudotuberculosis* ISOCITRATE DEHYDROGENASE KINASE/PHOSPHATASE (IDH KINASE/PHOSPHATASE) (EC 2\_7\_1\_116) (EC 3\_1\_3\_-)
- 2\_7\_1\_12 6601 *Yersinia pseudotuberculosis* THERMORESISTANT GLUCONOKINASE (EC 2\_7\_1\_12)
- 2\_7\_1\_130 7622 *Yersinia pseudotuberculosis* EC-ycaH TETRAACYLDISACCHARIDE 4'-KINASE (EC 2\_7\_1\_130)
- 2\_7\_1\_144 6436 *Yersinia pseudotuberculosis* EC-agaZ TAGATOSE 6-PHOSPHATE KINASE (EC 2\_7\_1\_144)
- 2\_7\_1\_15 4407 *Yersinia pseudotuberculosis* BS-rbsK RIBOKINASE (EC 2\_7\_1\_15)
- 2\_7\_1\_16 5545 *Yersinia pseudotuberculosis* EC-araB L-RIBULOKINASE (EC 2\_7\_1\_16)
- 2\_7\_1\_19 4335 *Yersinia pseudotuberculosis* PROBABLE PHOSPHORIBULOKINASE (EC 2\_7\_1\_19)
- 2\_7\_1\_2 4784 *Yersinia pseudotuberculosis* EC-yajF GLUCOKINASE (EC 2\_7\_1\_2)
- 2\_7\_1\_26 8052 *Yersinia pseudotuberculosis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)
- 2\_7\_1\_29 5021 *Yersinia pseudotuberculosis* DIHYDROXYACETONE KINASE (EC 2\_7\_1\_29)
- 2\_7\_1\_31 5010 *Yersinia pseudotuberculosis* BS-yxaA GLYCERATE KINASE (EC 2\_7\_1\_31)
- 2\_7\_1\_33 5823 *Yersinia pseudotuberculosis* EC-coaA PANTOTHENATE KINASE (EC 2\_7\_1\_33)
- 2\_7\_1\_39 7400 *Yersinia pseudotuberculosis* HOMOSERINE KINASE (EC 2\_7\_1\_39)
- 2\_7\_1\_4 7162 *Vibrio cholerae* El Tor N16961ORFA00335 FRUCTOKINASE (EC 2\_7\_1\_4)
- 2\_7\_1\_45 5998 *Yersinia pseudotuberculosis* EC-kdgK 2-DEHYDRO-3-DEOXYGLUCONOKINASE (EC 2\_7\_1\_45)
- 2\_7\_1\_49 5490 *Yersinia pseudotuberculosis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)
- 2\_7\_1\_5 7798 *Yersinia pseudotuberculosis* EC-rhaB RHAMNUKINASE (EC 2\_7\_1\_5)
- 2\_7\_1\_50 910 *Streptococcus pneumoniae* HYDROXYETHYLTHIAZOLE KINASE (EC 2\_7\_1\_50)
- 2\_7\_1\_51 6863 *Salmonella typhimurium* fucK L-FUCULOKINASE (EC 2\_7\_1\_51)
- 2\_7\_1\_53 376 *Salmonella paratyphi* CRYPTIC L-XYLULOSE KINASE (EC 2\_7\_1\_53)
- 2\_7\_1\_55 6308 *Escherichia coli* yjcT D-ALLOSE KINASE (EC 2\_7\_1\_55)
- 2\_7\_1\_56 4389 *Yersinia pseudotuberculosis* EC-fruK 1-PHOSPHOFRUCTOKINASE (EC 2\_7\_1\_56)
- 2\_7\_1\_58 5842 *Salmonella typhimurium* dgoK 2-DEHYDRO-3-DEOXYGALACTONOKINASE (EC 2\_7\_1\_58)
- 2\_7\_1\_60 56 *Yersinia pestis* EC-yhcI N-acetylmannosamine kinase (EC 2\_7\_1\_60)
- 2\_7\_1\_63 1471 *Mycobacterium tuberculosis* ppgK POLYPHOSPHATE GLUCOKINASE (EC 2\_7\_1\_63)
- 2\_7\_1\_66 4913 *Yersinia pseudotuberculosis* EC-bacA BACITRACIN RESISTANCE PROTEIN (PUTATIVE UNDECAPRENOL KINASE) (EC 2\_7\_1\_66)
- 2\_7\_1\_69 4239 *Yersinia pseudotuberculosis* PTS SYSTEM, N-ACETYLGLUCOSAMINE-SPECIFIC IIABC COMPONENT (EC 2\_7\_1\_69)
- 2\_7\_1\_71 4441 *Yersinia pseudotuberculosis* EC-aroK SHIKIMATE KINASE I (EC 2\_7\_1\_71)
- 2\_7\_1\_73 4465 *Yersinia pseudotuberculosis* INOSINE-GUANOSINE KINASE (EC 2\_7\_1\_73)
- 2\_7\_1\_87 5727 *Salmonella typhi* STREPTOMYCIN 3"-KINASE (EC 2\_7\_1\_87)
- 2\_7\_1\_90 93 *Treponema pallidum* TP0542 PYROPHOSPHATE--FRUCTOSE 6-PHOSPHATE 1-PHOSPHOTRANSFERASE (EC 2\_7\_1\_90)
- 2\_7\_1\_92 8176 *Yersinia pseudotuberculosis* BS-iolC 5-DEHYDRO-2-DEOXYGLUCONOKINASE (EC 2\_7\_1\_92)
- 2\_7\_1\_95 524 *Streptococcus equi* PROBABLE AMINOGLYCOSIDE 3'-PHOSPHOTRANSFERASE (EC 2\_7\_1\_95)
- 2\_7\_2\_1 5604 *Yersinia pseudotuberculosis* EC-ackA ACETATE KINASE (EC 2\_7\_2\_1)
- 2\_7\_2\_2 1436 *Streptococcus pyogenes* arcC CARBAMATE KINASE (EC 2\_7\_2\_2)
- 2\_7\_2\_4 5312 *Yersinia pseudotuberculosis* EC-lysC LYSINE-SENSITIVE ASPARTOKINASE III (EC 2\_7\_2\_4)
- 2\_7\_2\_7 16 *Enterococcus faecalis* BS-yqiU BUTYRATE KINASE (EC 2\_7\_2\_7)
- 2\_7\_2\_8 7306 *Yersinia pseudotuberculosis* EC-argB ACETYLGUTAMATE KINASE (EC 2\_7\_2\_8)
- 2\_7\_3\_3 1043 *Staphylococcus aureus* BS-yacI ARGININE KINASE (EC 2\_7\_3\_3)
- 2\_7\_3\_9 5194 *Yersinia pseudotuberculosis* EC-ptsI PHOSPHOENOLPYRUVATE-PROTEIN PHOSPHOTRANSFERASE (EC 2\_7\_3\_9)
- 2\_7\_4\_1 4919 *Yersinia pseudotuberculosis* EC-yfjB POLYPHOSPHATE KINASE (EC 2\_7\_4\_1) / NAD+ KINASE (EC 2\_7\_1\_23)
- 2\_7\_4\_16 7439 *Yersinia pseudotuberculosis* BS-ydiA THIAMIN-MONOPHOSPHATE KINASE (EC 2\_7\_4\_16)
- 2\_7\_4\_7 5490 *Yersinia pseudotuberculosis* BS-yjbV PHOSPHOMETHYLPYRIMIDINE KINASE (EC 2\_7\_4\_7) / HYDROXYMETHYLPYRIMIDINE KINASE (EC 2\_7\_1\_49)
- 2\_7\_6\_2 985 *Streptococcus pyogenes* BS-yloS THIAMIN PYROPHOSPHOKINASE (EC 2\_7\_6\_2)

- 2\_7\_6\_3 6004 *Yersinia pseudotuberculosis* EC-folK 2-AMINO-4-HYDROXY-6-HYDROXYMETHYLDIHYDROPTERIDINE PYROPHOSPHOKINASE (EC 2\_7\_6\_3)
- 2\_7\_6\_5 7788 *Yersinia pseudotuberculosis* EC-relA GTP PYROPHOSPHOKINASE (EC 2\_7\_6\_5)
- 2\_7\_7\_13 2591 *Saccharomyces cerevisiae* PSA1 MANNOSE-1-PHOSPHATE GUANYLTRANSFERASE (EC 2\_7\_7\_13)
- 2\_7\_7\_14 6600 *Saccharomyces cerevisiae* MUQ1 CTP: PHOSPHOETHANOLAMINE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_14)
- 2\_7\_7\_2 8052 *Yersinia pseudotuberculosis* EC-yaaC RIBOFLAVIN KINASE (EC 2\_7\_1\_26) / FMN ADENYLYLTRANSFERASE (EC 2\_7\_7\_2)
- 2\_7\_7\_22 2774 *Yersinia pestis*trQ9RCC5 MANNOSE-6-PHOSPHATE ISOMERASE (EC 5\_3\_1\_8) / MANNOSE-1-PHOSPHATE GUANYLYL TRANSFERASE (GDP) (EC 2\_7\_7\_22)
- 2\_7\_7\_24 6241 *Yersinia pseudotuberculosis* EC-rffH GLUCOSE-1-PHOSPHATE THYMIDYLYLTRANSFERASE (EC 2\_7\_7\_24)
- 2\_7\_7\_25 4553 *Yersinia pseudotuberculosis* EC-pcnB POLY(A) POLYMERASE (EC 2\_7\_7\_19) / TRNA NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_25)
- 2\_7\_7\_27 7615 *Yersinia pseudotuberculosis* EC-glgC GLUCOSE-1-PHOSPHATE ADENYLYLTRANSFERASE (EC 2\_7\_7\_27)
- 2\_7\_7\_3 5181 *Yersinia pseudotuberculosis* EC-kdtB PHOSPHOPANTETHEINE ADENYLYLTRANSFERASE (EC 2\_7\_7\_3)
- 2\_7\_7\_33 222 *Yersinia pseudotuberculosis* GLUCOSE-1-PHOSPHATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_33)
- 2\_7\_7\_38 5728 *Yersinia pseudotuberculosis* EC-kdsB 3-DEOXY-MANNO-OCTULOSONATE CYTIDYLYLTRANSFERASE (EC 2\_7\_7\_38)
- 2\_7\_7\_40 853 *Streptococcus pneumoniae* BS-yacM D-ribitol-5-phosphate cytidyltransferase (EC 2\_7\_7\_40)
- 2\_7\_7\_42 6017 *Yersinia pseudotuberculosis* EC-glnE GLUTAMATE-AMMONIA-LIGASE ADENYLYLTRANSFERASE (EC 2\_7\_7\_42)
- 2\_7\_7\_46 626 *Klebsiella pneumoniae* 2"-AMINOGLYCOSIDE NUCLEOTIDYLTRANSFERASE (EC 2\_7\_7\_46)
- 2\_7\_7\_47 1120 *Salmonella typhimurium* aadA STREPTOMYCIN 3"-ADENYLYLTRANSFERASE (EC 2\_7\_7\_47)
- 2\_7\_7\_53 2264 *Saccharomyces cerevisiae* APA2 5',5"-P-1,P-4-TETRAPHOSPHATE PHOSPHORYLASE II (EC 2\_7\_7\_53)
- 2\_7\_7\_59 6550 *Yersinia pseudotuberculosis* EC-glnD [PROTEIN-PII] URIDYLYLTRANSFERASE (EC 2\_7\_7\_59)
- 2\_7\_8\_1 560 *Treponema pallidum* TP0671 ETHANOLAMINEPHOSPHOTRANSFERASE (EC 2\_7\_8\_1)
- 2\_7\_8\_13 7940 *Yersinia pseudotuberculosis* EC-mraY PHOSPHO-N-ACETYLMURAMOYL-PENTAPEPTIDE-TRANSFERASE (EC 2\_7\_8\_13)
- 2\_7\_8\_20 1794 *Salmonella typhimurium* mdoB PHOSPHOGLYCEROL TRANSFERASE I (EC 2\_7\_8\_20)
- 2\_7\_8\_23 4666 *Salmonella dublin* PUTATIVE CARBOXYVINYL-CARBOXYPHOSPHONATE PHOSPHORYLMUTASE (EC 2\_7\_8\_23)
- 2\_7\_8\_5 5889 *Yersinia pseudotuberculosis* CDP-DIACYLGLYCEROL--GLYCEROL-3-PHOSPHATE 3-PHOSPHATIDYLYLTRANSFERASE (EC 2\_7\_8\_5)
- 2\_7\_8\_6 4143 *Vibrio cholerae* El Tor N16961 ORF00365 UNDECAPRENYL-PHOSPHATE GALACTOSEPHOSPHOTRANSFERASE (EC 2\_7\_8\_6)
- 2\_7\_8\_7 1716 *Yersinia pestis* EC-acpS HOLO-[ACYL-CARRIER PROTEIN] SYNTHASE (EC 2\_7\_8\_7)
- 2\_7\_8\_8 5969 *Yersinia pseudotuberculosis* EC-pssA CDP-DIACYLGLYCEROL--SERINE O-PHOSPHATIDYLYLTRANSFERASE (EC 2\_7\_8\_8)
- 2\_7\_9\_1 494 *Treponema pallidum* TP0746 PYRUVATE,PHOSPHATE DIKINASE (EC 2\_7\_9\_1)
- 2\_7\_9\_2 7957 *Yersinia pseudotuberculosis* EC-ppsA PHOSPHOENOLPYRUVATE SYNTHASE (EC 2\_7\_9\_2)
- 2\_8\_1\_6 7843 *Yersinia pseudotuberculosis* EC-bioB BIOTIN SYNTHASE (EC 2\_8\_1\_6)
- 2\_8\_2\_22 2571 *Salmonella typhimurium* ARYLSULFATE SULFOTRANSFERASE (EC 2\_8\_2\_22)
- 2\_8\_3\_1 1651 *Escherichia coli* ydiF propionate CoA-transferase (EC 2\_8\_3\_1)
- 2\_8\_3\_12 4714 *Pseudomonas aeruginosa* PA0227 GLUTACONATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_12)
- 2\_8\_3\_3 7781 *Pseudomonas aeruginosa* mdcA malonate CoA-transferase (EC 2\_8\_3\_3) / malonyl-CoA decarboxylase (EC 4\_1\_1\_9)
- 2\_8\_3\_6 5462 *Pseudomonas aeruginosa* PA2000 3-OXOADIPATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_6)
- 2\_8\_3\_8 1502 *Bordetella pertussis* butyryl-CoA:acetate coenzyme A transferase (EC 2\_8\_3\_8)
- 2\_8\_3\_9 1522 *Porphyromonas gingivalis* EC-atoA BUTYRATE-ACETOACETATE COA-TRANSFERASE SUBUNIT B (EC 2\_8\_3\_9)



- 2\_9\_1\_1 7835 *Yersinia pseudotuberculosis* EC-selA L-SERYL-TRNA(SEC) SELENIUM TRANSFERASE (EC 2\_9\_1\_1)
- 3\_1\_1\_10 5017 *Yersinia pestis* TROPINESTERASE (EC 3\_1\_1\_10)
- 3\_1\_1\_11 4009 *Yersinia pestis* PECTINESTERASE A PRECURSOR (EC 3\_1\_1\_11)
- 3\_1\_1\_17 3906 *Salmonella typhimurium* GLUCONOLACTONASE (EC 3\_1\_1\_17)
- 3\_1\_1\_20 3532 *Klebsiella pneumoniae* TANNASE PRECURSOR (EC 3\_1\_1\_20)
- 3\_1\_1\_24 533 *Streptococcus mutans* 3-OXOADIPATE ENOL-LACTONASE (EC 3\_1\_1\_24)
- 3\_1\_1\_41 319 *Bacillus subtilis* cah CEPHALOSPORIN-C DEACETYLASE (EC 3\_1\_1\_41)
- 3\_1\_1\_45 5384 *Yersinia pseudotuberculosis* PUTATIVE CARBOXYMETHYLENEBUTENOLIDASE (EC 3\_1\_1\_45)
- 3\_1\_1\_57 1506 *Yersinia pestis* Q9ZC43 2-PYRONE-4,6-DICARBOXYLATE LACTONASE (EC 3\_1\_1\_57)
- 3\_1\_1\_61 4947 *Yersinia pseudotuberculosis* EC-cheB PROTEIN-GLUTAMATE METHYLESTERASE (EC 3\_1\_1\_61)
- 3\_1\_1\_72 970 *Streptococcus pneumoniae* acetylxyloxy esterase (EC 3\_1\_1\_72)
- 3\_1\_1\_11 6283 *Yersinia pseudotuberculosis* EC-sbcB EXODEOXYRIBONUCLEASE I (EC 3\_1\_1\_11)
- 3\_1\_1\_3 1657 *Salmonella typhi* EXONUCLEASE (EC 3\_1\_1\_3)
- 3\_1\_1\_5 4547 *Yersinia pseudotuberculosis* EXODEOXYRIBONUCLEASE V GAMMA CHAIN (EC 3\_1\_1\_5)
- 3\_1\_1\_6 4498 *Yersinia pseudotuberculosis* EC-xseA EXODEOXYRIBONUCLEASE VII LARGE SUBUNIT (EC 3\_1\_1\_6)
- 3\_1\_1\_3 1035 *Saccharomyces cerevisiae* PAN3 PAB-DEPENDENT POLY(A)-SPECIFIC RIBONUCLEASE SUBUNIT PAN3 (EC 3\_1\_1\_3)
- 3\_1\_2\_14 431 *Streptococcus pyogenes* OLEOYL-ACYL CARRIER PROTEIN THIOESTERASE (EC 3\_1\_2\_14)
- 3\_1\_2\_1 4558 *Yersinia pseudotuberculosis* BS-yqfS ENDONUCLEASE IV (EC 3\_1\_2\_1)
- 3\_1\_2\_3 4292 *Yersinia pseudotuberculosis* TYPE I RESTRICTION ENZYME HSDR (EC 3\_1\_2\_3)
- 3\_1\_2\_4 154 *Ureaplasma urealyticum* UU036 TYPE IIS RESTRICTION ENZYME ECO57I (EC 3\_1\_2\_4)
- 3\_1\_2\_5 2715 *Salmonella typhimurium* res TYPE III RESTRICTION-MODIFICATION SYSTEM STYLT I ENZYME RES (EC 3\_1\_2\_5)
- 3\_1\_2\_4 7017 *Yersinia pseudotuberculosis* EC-ruvC CROSSOVER JUNCTION ENDODEOXYRIBONUCLEASE RUV C (EC 3\_1\_2\_4)
- 3\_1\_2\_5 1460 *Pasteurella multocida* ENDONUCLEASE V (EC 3\_1\_2\_5)
- 3\_1\_2\_7 3086 *Saccharomyces cerevisiae* RNY1 RIBONUCLEASE TRV (EC 3\_1\_2\_7)
- 3\_1\_2\_3 1446 *Corynebacterium diphtheriae* GUANYL-SPECIFIC RIBONUCLEASE SA3 (EC 3\_1\_2\_3)
- 3\_1\_2\_6 890 *Salmonella typhimurium* msA RIBONUCLEASE I PRECURSOR (EC 3\_1\_2\_6)
- 3\_1\_3\_10 1010 *Salmonella typhimurium* agp GLUCOSE-1-PHOSPHATASE PRECURSOR (EC 3\_1\_3\_10)
- 3\_1\_3\_12 2803 *Salmonella typhimurium* otsB TREHALOSE-PHOSPHATASE (EC 3\_1\_3\_12)
- 3\_1\_3\_15 7520 *Yersinia pseudotuberculosis* HISTIDINOL-PHOSPHATASE (EC 3\_1\_3\_15)
- 3\_1\_3\_27 4737 *Yersinia pseudotuberculosis* EC-pgpB PHOSPHATIDYLGLYCEROPHOSPHATASE B (EC 3\_1\_3\_27)
- 3\_1\_3\_33 4737 *Saccharomyces cerevisiae* CTL1 POLYNUCLEOTIDE 5'-TRIPHOSPHATASE (EC 3\_1\_3\_33)
- 3\_1\_3\_43 5464 *Saccharomyces cerevisiae* PTC5 [PYRUVATE DEHYDROGENASE (LIPOAMIDE) (PDP) (EC 3\_1\_3\_43)]
- 3\_1\_3\_68 324 *Saccharomyces cerevisiae* DOG1 2-DEOXYGLUCOSE-6-PHOSPHATE PHOSPHATASE I (EC 3\_1\_3\_68)
- 3\_1\_3\_2 6201 *Salmonella typhimurium* NUCLEASE PRECURSOR (EC 3\_1\_3\_2)
- 3\_1\_3\_1 407 *Staphylococcus aureus* THERMONUCLEASE PRECURSOR (EC 3\_1\_3\_1)
- 3\_1\_4\_14 6761 *Yersinia pseudotuberculosis* EC-acpD [acyl-carrier-protein] phosphodiesterase (EC 3\_1\_4\_14)
- 3\_1\_4\_16 7144 *Yersinia pseudotuberculosis* EC-cpdB 2',3'-CYCLIC-NUCLEOTIDE 2'-PHOSPHODIESTERASE PRECURSOR (EC 3\_1\_4\_16)
- 3\_1\_4\_3 2654 *Staphylococcus aureus* PHOSPHOLIPASE C PRECURSOR (EC 3\_1\_4\_3)
- 3\_1\_5\_1 7234 *Yersinia pseudotuberculosis* DEOXYGUANOSINETRIPHOSPHATE TRIPHOSPHOHYDROLASE (EC 3\_1\_5\_1)
- 3\_1\_6\_6 559 *Pseudomonas aeruginosa* betC CHOLINE-SULFATASE (EC 3\_1\_6\_6)
- 3\_1\_7\_2 7363 *Yersinia pseudotuberculosis* BS-relA GUANOSINE-3',5'-BIS(DIPHOSPHATE) 3'-PYROPHOSPHOHYDROLASE (EC 3\_1\_7\_2)
- 3\_1\_1\_1 7112 *Vibrio cholerae* El Tor N16961ORFA00274 phosphonoacetaldehyde hydrolase (EC 3\_1\_1\_1)
- 3\_1\_1\_2 5981 *Bordetella bronchiseptica* PHOSPHONOACETATE HYDROLASE (EC 3\_1\_1\_2)
- 3\_2\_1\_11 139 *Streptococcus mutans* DEXTRANASE PRECURSOR (EC 3\_2\_1\_11)
- 3\_2\_1\_122 6142 *Escherichia coli* glvG MALTOSYL-6'-PHOSPHATE GLUCOSIDASE (EC 3\_2\_1\_122)

- 3\_2\_1\_135 516 *Clostridium difficile* BS-yvdF NEOPULLULANASE (EC 3\_2\_1\_135)
- 3\_2\_1\_141 1364 *Salmonella typhimurium* MALTOOLIGOSYLTREHALOSE TREHALOHYDROLASE (EC 3\_2\_1\_141)
- 3\_2\_1\_15 1800 *Streptococcus pneumoniae* POLYGALACTURONASE (EC 3\_2\_1\_15)
- 3\_2\_1\_26 7161 *Vibrio cholerae* El Tor N16961ORFA00334 SUCROSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_26)
- 3\_2\_1\_3 661 *Saccharomyces cerevisiae* SGA1 GLUCOAMYLASE, INTRACELLULAR SPORULATION-SPECIFIC (EC 3\_2\_1\_3)
- 3\_2\_1\_4 5496 *Yersinia pseudotuberculosis* EC-yhjM ENDOGLUCANASE (EC 3\_2\_1\_4)
- 3\_2\_1\_41 197 *Streptococcus pyogenes* pulA PULLULANASE (EC 3\_2\_1\_41)
- 3\_2\_1\_54 769 *Streptococcus pyogenes* amyB CYCLOMALTODEXTRINASE (EC 3\_2\_1\_54)
- 3\_2\_1\_55 2898 *Enterococcus faecium* (DOE) BS-abfA ALPHA-L-ARABINOFURANOSIDASE I (EC 3\_2\_1\_55)
- 3\_2\_1\_58 3283 *Saccharomyces cerevisiae* EXG1 GLUCAN 1,3-BETA-GLUCOSIDASE I/II PRECURSOR (EC 3\_2\_1\_58)
- 3\_2\_1\_65 3452 *Clostridium acetobutylicum* 23600003\_F1\_2 LEVANASE (EC 3\_2\_1\_65)
- 3\_2\_1\_70 48 *Streptococcus pyogenes* dexB GLUCAN 1,6-ALPHA-GLUCOSIDASE (EC 3\_2\_1\_70)
- 3\_2\_1\_73 1672 *Streptococcus mutans* EC-yhjM BETA-GLUCANASE PRECURSOR (EC 3\_2\_1\_73)
- 3\_2\_1\_74 2831 *Clostridium acetobutylicum* 35394681\_F1\_1 glucan 1,4-beta-glucosidase (EC 3\_2\_1\_74)
- 3\_2\_1\_78 939 *Clostridium acetobutylicum* 5267842\_C2\_39 MANNAN ENDO-1,4-BETA-MANNOSIDASE A AND B (EC 3\_2\_1\_78)
- 3\_2\_1\_8 6615 *Vibrio cholerae* El Tor N16961ORFA01011 ENDO-1,4-BETA-XYLANASE A PRECURSOR (EC 3\_2\_1\_8)
- 3\_2\_1\_80 532 *Streptococcus mutans* FRUCTAN BETA-FRUCTOSIDASE PRECURSOR (EC 3\_2\_1\_80)
- 3\_2\_1\_81 2950 *Pseudomonas aeruginosa* PA1046 BETA-AGARASE B (EC 3\_2\_1\_81)
- 3\_2\_1\_83 51 *Clostridium acetobutylicum* 22439426\_F3\_127 KAPPA-CARRAGEENASE (EC 3\_2\_1\_83)
- 3\_2\_1\_85 168 *Streptococcus pyogenes* lacG 6-PHOSPHO-BETA-GALACTOSIDASE (EC 3\_2\_1\_85)
- 3\_2\_1\_86 6489 *Yersinia pseudotuberculosis* EC-bglA 6-PHOSPHO-BETA-GLUCOSIDASE BGLA (EC 3\_2\_1\_86)
- 3\_2\_1\_89 4501 *Yersinia pseudotuberculosis* ARABINO GALACTAN ENDO-1,4-BETA-GALACTOSIDASE PRECURSOR (EC 3\_2\_1\_89)
- 3\_2\_1\_91 101 *Neurospora crassa* CBH-1 EXOGLUCANASE I PRECURSOR (EC 3\_2\_1\_91)
- 3\_2\_1\_93 5327 *Yersinia pseudotuberculosis* EC-treC TREHALOSE-6-PHOSPHATE HYDROLASE (EC 3\_2\_1\_93)
- 3\_2\_1\_99 2875 *Bacillus subtilis* abnA ARABINAN ENDO-1,5-ALPHA-L-ARABINOSIDASE A (EC 3\_2\_1\_99)
- 3\_2\_2\_1 1353 *Staphylococcus aureus* EC-yaaF INOSINE-URIDINE PREFERRING NUCLEOSIDE HYDROLASE (EC 3\_2\_2\_1)
- 3\_2\_2\_20 8086 *Yersinia pseudotuberculosis* DNA-3-METHYLADENINE GLYCOSYLASE (EC 3\_2\_2\_20)
- 3\_2\_2\_23 5180 *Yersinia pseudotuberculosis* EC-mutM FORMAMIDOPYRIMIDINE-DNA GLYCOSYLASE (EC 3\_2\_2\_23)
- 3\_2\_2\_4 6262 *Yersinia pseudotuberculosis* AMP NUCLEOSIDASE (EC 3\_2\_2\_4)
- 3\_2\_2\_9 7233 *Yersinia pseudotuberculosis* BS-yrrU 5'-METHYLTHIOADENOSINE NUCLEOSIDASE (EC 3\_2\_2\_16) / S-ADENOSYLHOMOCYSTEINE NUCLEOSIDASE (EC 3\_2\_2\_9)
- 3\_3\_2\_1 4626 *Vibrio cholerae* El Tor N16961 ORF01033 ISOCHORISMATASE (EC 3\_3\_2\_1)
- 3\_4\_11\_10 7319 *Vibrio cholerae* El Tor N16961ORFA00535 BACTERIAL LEUCYL AMINOPEPTIDASE PRECURSOR (EC 3\_4\_11\_10)
- 3\_4\_11\_12 256 *Bordetella pertussis* AMINOPEPTIDASE II (EC 3\_4\_11\_12)
- 3\_4\_11\_19 7020 *Pseudomonas aeruginosa* PA1486 D-AMINOPEPTIDASE (EC 3\_4\_11\_19)
- 3\_4\_14\_11 298 *Streptococcus pyogenes* pepXP XAA-PRO DIPEPTIDYL-PEPTIDASE (EC 3\_4\_14\_11)
- 3\_4\_15\_5 354 *Salmonella typhimurium* dcp PEPTIDYL-DIPEPTIDASE DCP (EC 3\_4\_15\_5)
- 3\_4\_16\_4 5028 *Yersinia pseudotuberculosis* D-ALANYL-D-ALANINE CARBOXYPEPTIDASE (EC 3\_4\_16\_4)
- 3\_4\_16\_6 1841 *Saccharomyces cerevisiae* KEX1 CARBOXYPEPTIDASE KEX1 PRECURSOR (EC 3\_4\_16\_6)
- 3\_4\_17\_11 2633 *Pseudomonas aeruginosa* cpg2 CARBOXYPEPTIDASE G2 PRECURSOR (EC 3\_4\_17\_11)
- 3\_4\_17\_19 6941 *Yersinia pseudotuberculosis* BS-ypwA THERMOSTABLE CARBOXYPEPTIDASE I (EC 3\_4\_17\_19)
- 3\_4\_17\_4 2244 *Saccharomyces cerevisiae* CPS1 CARBOXYPEPTIDASE S PRECURSOR (EC 3\_4\_17\_4)
- 3\_4\_19\_3 5540 *Yersinia pseudotuberculosis* PYRROLIDONE-CARBOXYLATE PEPTIDASE (EC 3\_4\_19\_3)

- 3\_4\_19\_5 3689 *Salmonella typhimurium* iadA ISOASPARTYL DIPEPTIDASE (EC 3\_4\_19\_5)  
 3\_4\_21\_48 2655 *Saccharomyces cerevisiae* PRB1 CEREVISIN PRECURSOR (EC 3\_4\_21\_48)  
 3\_4\_21\_50 3933 *Pseudomonas aeruginosa* PA4175 PROTEASE I PRECURSOR (EC 3\_4\_21\_50)  
 3\_4\_21\_61 2851 *Saccharomyces cerevisiae* KEX2 KEXIN PRECURSOR (EC 3\_4\_21\_61)  
 3\_4\_21\_62 1030 *Bacillus subtilis* aprE SUBTILISIN E PRECURSOR (EC 3\_4\_21\_62)  
 3\_4\_21\_72 1680 *Neisseria gonorrhoeae* IMMUNOGLOBULIN A1 PROTEASE (EC 3\_4\_21\_72)  
 3\_4\_21\_87 4520 *Escherichia coli* ompT PROTEASE VII PRECURSOR (EC 3\_4\_21\_87)  
 3\_4\_21\_88 6837 *Yersinia pseudotuberculosis* EC-lexA LEXA REPRESSOR (EC 3\_4\_21\_88)  
 3\_4\_22\_37 1707 *Porphyromonas gingivalis* O33441 ARGININE-SPECIFIC CYSTEINE PROTEINASE RGP-2 (EC 3\_4\_22\_37)  
 3\_4\_23\_23 20437 *Neurospora crassa* MUCOROPEPSIN PRECURSOR (EC 3\_4\_23\_23)  
 3\_4\_23\_25 1788 *Saccharomyces cerevisiae* PEP4 SACCHAROPEPSIN PRECURSOR (EC 3\_4\_23\_25)  
 3\_4\_23\_35 4561 *Saccharomyces cerevisiae* BARI BARRIERPEPSIN PRECURSOR (EC 3\_4\_23\_35)  
 3\_4\_23\_36 8054 *Yersinia pseudotuberculosis* EC-lspA LIPOPROTEIN SIGNAL PEPTIDASE (EC 3\_4\_23\_36)  
 3\_4\_24\_25 7371 *Vibrio cholerae* El Tor N16961ORFA00596 NEUTRAL PROTEASE PRECURSOR (EC 3\_4\_24\_25)  
 3\_4\_24\_26 7085 *Pseudomonas aeruginosa* lasB PSEUDOLYSIN PRECURSOR (EC 3\_4\_24\_26)  
 3\_4\_24\_28 1628 *Enterococcus faecalis* BACILLOLYSIN PRECURSOR (EC 3\_4\_24\_28)  
 3\_4\_24\_3 244 *Streptococcus pyogenes* BS-yrnN COLLAGENASE (EC 3\_4\_24\_3)  
 3\_4\_24\_36 20058 *Neurospora crassa* LEISHMANOLYSIN PRECURSOR (EC 3\_4\_24\_36)  
 3\_4\_24\_37 4431 *Saccharomyces cerevisiae* PRD1 SACCHAROLYSIN (EC 3\_4\_24\_37)  
 3\_4\_24\_55 4959 *Yersinia pseudotuberculosis* BS-ymfH PROTEASE III PRECURSOR (EC 3\_4\_24\_55)  
 3\_4\_24\_57 4630 *Yersinia pseudotuberculosis* O-SIALOGLYCOPROTEIN ENDOPEPTIDASE (EC 3\_4\_24\_57)  
 3\_4\_24\_70 7926 *Yersinia pseudotuberculosis* EC-prIC OLIGOPEPTIDASE A (EC 3\_4\_24\_70)  
 3\_4\_24\_75 3190 *Staphylococcus aureus* LYSOSTAPHIN PRECURSOR (EC 3\_4\_24\_75)  
 3\_5\_1\_1 4155 *Yersinia pseudotuberculosis* EC-ansB L-ASPARAGINASE II PRECURSOR (EC 3\_5\_1\_1)  
 3\_5\_1\_10 4326 *Yersinia pseudotuberculosis* FORMYLTETRAHYDROFOLATE DEFORMYLASE (EC 3\_5\_1\_10)  
 3\_5\_1\_11 2811 *Staphylococcus aureus* BS-yxel PENICILLIN ACYLASE (EC 3\_5\_1\_11)  
 3\_5\_1\_16 4279 *Yersinia pseudotuberculosis* EC-argE ACETYLORNITHINE DEACETYLASE (EC 3\_5\_1\_16)  
 3\_5\_1\_18 7425 *Yersinia pseudotuberculosis* EC-dapE SUCCINYL-DIAMINOPIMELATE DESUCCINYLASE (EC 3\_5\_1\_18)  
 3\_5\_1\_19 5821 *Yersinia pseudotuberculosis* EC-ydjB PYRAZINAMIDASE/NICOTINAMIDASE [INCLUDES: PYRAZINAMIDASE (EC 3\_5\_1\_-) / NICOTINAMIDASE (EC 3\_5\_1\_19)]  
 3\_5\_1\_23 933 *Pseudomonas aeruginosa* PA0845 ALKALINE CERAMIDASE (EC 3\_5\_1\_23)  
 3\_5\_1\_24 7383 *Vibrio cholerae* El Tor N16961ORFA00610 CHOLYLGLYCINE HYDROLASE (EC 3\_5\_1\_24)  
 3\_5\_1\_25 5703 *Yersinia pseudotuberculosis* N-ACETYLGLUCOSAMINE-6-PHOSPHATE DEACETYLASE (EC 3\_5\_1\_25)  
 3\_5\_1\_32 20244 *Neurospora crassa* HIPPURATE HYDROLASE (EC 3\_5\_1\_32)  
 3\_5\_1\_33 1494 *Streptococcus pneumoniae* peptidoglycan N-acetylglucosamine deacetylase (EC 3\_5\_1\_33)  
 3\_5\_1\_38 725 *Pseudomonas aeruginosa* ansB GLUTAMINASE-ASPARAGINASE (EC 3\_5\_1\_38)  
 3\_5\_1\_4 6585 *Saccharomyces cerevisiae* AMD2 AMIDASE (EC 3\_5\_1\_4)  
 3\_5\_1\_41 2609 *Saccharomyces cerevisiae* CDA1 CHITIN DEACETYLASE 2 (EC 3\_5\_1\_41)  
 3\_5\_1\_46 423 *Pseudomonas aeruginosa* PA5542 6-AMINOHEXANOATE-DIMER HYDROLASE (EC 3\_5\_1\_46)  
 3\_5\_1\_49 3660 *Bordetella pertussis* FORMAMIDASE (EC 3\_5\_1\_49)  
 3\_5\_1\_5 6613 *Yersinia pseudotuberculosis* UREASE ALPHA SUBUNIT (EC 3\_5\_1\_5)  
 3\_5\_1\_54 4285 *Yersinia pseudotuberculosis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) / ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)  
 3\_5\_1\_59 2726 *Staphylococcus aureus* BS-yaal N-CARBAMOYLSARCOSINE AMIDASE (EC 3\_5\_1\_59)  
 3\_5\_1\_68 7027 *Yersinia pseudotuberculosis* N-formylglutamate deformylase (EC 3\_5\_1\_68)  
 3\_5\_1\_78 6658 *Salmonella typhimurium* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) / GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 3\_5\_1\_80 6605 *Escherichia coli* agaA N-acetylgalactosamine-6-phosphate deacetylase (EC 3\_5\_1\_80)  
 3\_5\_1\_81 6947 *Klebsiella pneumoniae* D-AMINOACYLASE (EC 3\_5\_1\_81)  
 3\_5\_1\_82 637 *Mycobacterium tuberculosis* Rv2913c N-ACYL-D-GLUTAMATE DEACYLASE (EC 3\_5\_1\_82)  
 3\_5\_2\_10 360 *Mycobacterium tuberculosis* Rv0695 creatininase (EC 3\_5\_2\_10)

- 3\_5\_2\_12 903 *Streptococcus pyogenes* amiC 6-AMINOHEXANOATE-CYCLIC-DIMER HYDROLASE (EC 3\_5\_2\_12)
- 3\_5\_2\_14 4214 *Saccharomyces cerevisiae* YKL215C N-methylhydantoinase (ATP-hydrolyzing) (EC 3\_5\_2\_14) / 5-OXOPROLINASE (EC 3\_5\_2\_9)
- 3\_5\_2\_5 5495 *Salmonella typhimurium* ALLANTOINASE (EC 3\_5\_2\_5)
- 3\_5\_2\_6 2373 *Yersinia pestis* BETA-LACTAMASE PRECURSOR, TYPE II (EC 3\_5\_2\_6)
- 3\_5\_2\_7 7028 *Yersinia pseudotuberculosis* BS-hutI IMIDAZOLONEPROPIONASE (EC 3\_5\_2\_7)
- 3\_5\_3\_11 7320 *Vibrio cholerae* El Tor N16961ORFA00536 AGMATINASE (EC 3\_5\_3\_11)
- 3\_5\_3\_19 6600 *Salmonella typhimurium* glxA2 UREIDOGLYCOLATE HYDROLASE (EC 3\_5\_3\_19)
- 3\_5\_3\_4 2548 *Saccharomyces cerevisiae* DAL2 ALLANTOICASE (EC 3\_5\_3\_4)
- 3\_5\_3\_6 4290 *Vibrio cholerae* El Tor N16961 ORF00596 ARGININE DEIMINASE (EC 3\_5\_3\_6)
- 3\_5\_3\_8 5030 *Vibrio cholerae* El Tor N16961 ORF01564 FORMIMINOGLUTAMASE (EC 3\_5\_3\_8)
- 3\_5\_3\_9 6912 *Yersinia pseudotuberculosis* BS-yurH allantoate deiminase (EC 3\_5\_3\_9)
- 3\_5\_4\_1 7885 *Yersinia pseudotuberculosis* CYTOSINE DEAMINASE (EC 3\_5\_4\_1)
- 3\_5\_4\_13 6177 *Yersinia pseudotuberculosis* DEOXYCYTIDINE TRIPHOSPHATE DEAMINASE (EC 3\_5\_4\_13)
- 3\_5\_4\_19 6635 *Yersinia pseudotuberculosis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)
- 3\_5\_4\_2 799 *Klebsiella pneumoniae* ADENINE DEAMINASE (EC 3\_5\_4\_2)
- 3\_5\_4\_23 1867 *Clostridium acetobutylicum* 4812802\_C2\_34 BLASTICIDIN-S DEAMINASE (EC 3\_5\_4\_23)
- 3\_5\_4\_25 5338 *Yersinia pseudotuberculosis* EC-ribB GTP CYCLOHYDROLASE II (EC 3\_5\_4\_25)
- 3\_5\_4\_26 4162 *Yersinia pseudotuberculosis* EC-ribD DIAMINOHYDROXYPHOSPHORIBOSYLAMINOPYRIMIDINE DEAMINASE (EC 3\_5\_4\_26) / 5-AMINO-6-(5-PHOSPHORIBOSYLAMINO)URACIL REDUCTASE (EC 1\_1\_1\_193)
- 3\_5\_5\_1 1428 *Streptococcus mutans* BS-ykrU NITRILASE (EC 3\_5\_5\_1)
- 3\_5\_5\_7 471 *Saccharomyces cerevisiae* NIT1 ALIPHATIC NITRILASE (EC 3\_5\_5\_7)
- 3\_6\_1\_10 7046 *Saccharomyces cerevisiae* PHM5 alkaline phosphatase vacuolar precursor (EC 3\_1\_3\_1) / endopolyphosphatase vacuolar precursor (EC 3\_6\_1\_10)
- 3\_6\_1\_11 8103 *Yersinia pseudotuberculosis* EXOPOLYPHOSPHATASE (EC 3\_6\_1\_11)
- 3\_6\_1\_22 3886 *Escherichia coli* yjaD NADH PYROPHOSPHATASE (EC 3\_6\_1\_22)
- 3\_6\_1\_26 7057 *Yersinia pseudotuberculosis* CDP-DIACYLGLYCEROL PYROPHOSPHATASE (EC 3\_6\_1\_26)
- 3\_6\_1\_31 6635 *Yersinia pseudotuberculosis* EC-hisI PHOSPHORIBOSYL-AMP CYCLOHYDROLASE (EC 3\_5\_4\_19) / PHOSPHORIBOSYL-ATP PYROPHOSPHOHYDROLASE (EC 3\_6\_1\_31)
- 3\_6\_1\_35 5832 *Saccharomyces cerevisiae* PMA2 PLASMA MEMBRANE ATPASE 2 (EC 3\_6\_1\_35)
- 3\_6\_1\_40 6862 *Yersinia pseudotuberculosis* EC-gppA GUANOSINE-5'-TRIPHOSPHATE,3'-DIPHOSPHATE PYROPHOSPHATASE (EC 3\_6\_1\_40)
- 3\_6\_1\_41 6276 *Yersinia pseudotuberculosis* EC-apaH BIS(5'-NUCLEOSYL)-TETRAPHOSPHATASE (SYMMETRICAL) (EC 3\_6\_1\_41)
- 3\_6\_1\_45 3730 *Yersinia pestis* UDP-SUGAR HYDROLASE PRECURSOR (EC 3\_6\_1\_45)
- 3\_6\_3\_12 859 *Salmonella dublin* POTASSIUM-TRANSPORTING ATPASE B CHAIN (EC 3\_6\_3\_12)
- 3\_7\_1\_3 1374 *Saccharomyces cerevisiae* YLR231C KYNURENINASE, L-KYNURENINE HYDROLASE (EC 3\_7\_1\_3)
- 3\_7\_1\_5 4076 *Salmonella typhimurium* fumarylpyruvate hydrolase (EC 3\_7\_1\_5)
- 3\_8\_1\_2 4935 *Yersinia pseudotuberculosis* 2-HALOALKANOIC ACID DEHALOGENASE I (EC 3\_8\_1\_2)
- 3\_8\_1\_3 5385 *Salmonella typhimurium* HALOACETATE DEHALOGENASE H-1 (EC 3\_8\_1\_3)
- 3\_8\_1\_5 758 *Mycobacterium tuberculosis* Rv2296 HALOALKANE DEHALOGENASE (EC 3\_8\_1\_5)
- 4\_1\_1\_1 4824 *Saccharomyces cerevisiae* PDC6 PYRUVATE DECARBOXYLASE ISOZYME 3 (EC 4\_1\_1\_1)
- 4\_1\_1\_11 7186 *Yersinia pseudotuberculosis* EC-panD ASPARTATE 1-DECARBOXYLASE PRECURSOR (EC 4\_1\_1\_11)
- 4\_1\_1\_18 611 *Vibrio cholerae* El Tor N16961 ORF00395 LYSINE DECARBOXYLASE, INDUCIBLE (EC 4\_1\_1\_18)
- 4\_1\_1\_19 4352 *Yersinia pseudotuberculosis* EC-speA BIOSYNTHETIC ARGININE DECARBOXYLASE (EC 4\_1\_1\_19)
- 4\_1\_1\_2 1184 *Streptococcus mutans* OXALATE DECARBOXYLASE (EC 4\_1\_1\_2)
- 4\_1\_1\_20 7661 *Yersinia pseudotuberculosis* EC-lysA DIAMINOPIMELATE DECARBOXYLASE (EC 4\_1\_1\_20)
- 4\_1\_1\_25 20388 *Neurospora crassa* TYROSINE DECARBOXYLASE 4 (EC 4\_1\_1\_25)
- 4\_1\_1\_3 4412 *Vibrio cholerae* El Tor N16961 ORF00764 OXALOACETATE DECARBOXYLASE ALPHA CHAIN (EC 4\_1\_1\_3)

- 4\_1\_1\_31 5142 *Yersinia pseudotuberculosis* PHOSPHOENOLPYRUVATE CARBOXYLASE (EC 4\_1\_1\_31)
- 4\_1\_1\_36 6572 *Yersinia pseudotuberculosis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)
- 4\_1\_1\_39 1360 *Bacillus subtilis* ykrW RIBULOSE BISPHOSPHATE CARBOXYLASE LARGE CHAIN (EC 4\_1\_1\_39)
- 4\_1\_1\_4 674 *Clostridium acetobutylicum* 26181517\_C1\_30 ACETOACETATE DECARBOXYLASE (EC 4\_1\_1\_4)
- 4\_1\_1\_41 849 *Streptococcus pyogenes* methylmalonyl-CoA decarboxylase gamma chain (EC 4\_1\_1\_41)
- 4\_1\_1\_44 4250 *Yersinia pseudotuberculosis* 4-CARBOXYMUCONOLACTONE DECARBOXYLASE (EC 4\_1\_1\_44)
- 4\_1\_1\_47 6602 *Salmonella typhimurium* gcl GLYOXYLATE CARBOXYLASE (EC 4\_1\_1\_47)
- 4\_1\_1\_48 6735 *Yersinia pseudotuberculosis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)
- 4\_1\_1\_49 6832 *Yersinia pseudotuberculosis* EC-pckA PHOSPHOENOLPYRUVATE CARBOXYKINASE (ATP) (EC 4\_1\_1\_49)
- 4\_1\_1\_5 5395 *Vibrio cholerae* El Tor N16961 ORF02026 ALPHA-ACETOLACTATE DECARBOXYLASE (EC 4\_1\_1\_5)
- 4\_1\_1\_55 3306 *Bordetella pertussis* 4,5-DIHYDROXYPHTHALATE DECARBOXYLASE (EC 4\_1\_1\_55)
- 4\_1\_1\_61 365 *Bacillus subtilis* yclC 4-HYDROXYBENZOATE DECARBOXYLASE (EC 4\_1\_1\_61)
- 4\_1\_1\_7 5394 *Pseudomonas aeruginosa* mdIC BENZOYLFORMATE DECARBOXYLASE (EC 4\_1\_1\_7)
- 4\_1\_1\_71 8096 *Yersinia pseudotuberculosis* EC-menD 2-SUCCINYL-6-HYDROXY-2,4-CYCLOHEXADIENE-1-CARBOXYLATE SYNTHASE / 2-OXOGLUTARATE DECARBOXYLASE (EC 4\_1\_1\_71)
- 4\_1\_1\_74 1692 *Staphylococcus aureus* EC-ilvB INDOLE-3-PYRUVATE DECARBOXYLASE (EC 4\_1\_1\_74)
- 4\_1\_1\_8 5464 *Mycobacterium tuberculosis* oxaA OXALYL-COA DECARBOXYLASE (EC 4\_1\_1\_8)
- 4\_1\_1\_9 7781 *Pseudomonas aeruginosa* mdcA malonate CoA-transferase (EC 2\_8\_3\_3) / malonyl-CoA decarboxylase (EC 4\_1\_1\_9)
- 4\_1\_2\_14 6410 *Yersinia pseudotuberculosis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_2\_14) / 2-DEHYDRO-3-DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_2\_15 5531 *Yersinia pseudotuberculosis* PHOSPHO-2-DEHYDRO-3-DEOXYHEPTONATE ALDOLASE, PHE-SENSITIVE (EC 4\_1\_2\_15)
- 4\_1\_2\_16 6231 *Yersinia pseudotuberculosis* EC-kdsA 2-DEHYDRO-3-DEOXYPHOSPHOCTONATE ALDOLASE (EC 4\_1\_2\_16)
- 4\_1\_2\_17 6744 *Yersinia pseudotuberculosis* BS-ykrY L-FUCULOSE PHOSPHATE ALDOLASE (EC 4\_1\_2\_17)
- 4\_1\_2\_19 7795 *Yersinia pseudotuberculosis* EC-rhaD RHAMNULOSE-1-PHOSPHATE ALDOLASE (EC 4\_1\_2\_19)
- 4\_1\_2\_20 4593 *Salmonella typhimurium* 2-DEHYDRO-3-DEOXYGLUCARATE ALDOLASE (EC 4\_1\_2\_20)
- 4\_1\_2\_21 110 *Salmonella paratyphi* 2-DEHYDRO-3-DEOXYPHOSPHOGALACTONATE ALDOLASE (EC 4\_1\_2\_21) / GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)
- 4\_1\_2\_25 3510 *Yersinia pestis* EC-ygiG DIHYDRONEOPTERIN ALDOLASE (EC 4\_1\_2\_25)
- 4\_1\_2\_29 3960 *Bacillus subtilis* iolJ 5-DEHYDRO-2-DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_29)
- 4\_1\_2\_40 421 *Streptococcus pyogenes* lacD\_1 TAGATOSE 1,6-DIPHOSPHATE ALDOLASE (EC 4\_1\_2\_40)
- 4\_1\_2\_5 2794 *Staphylococcus aureus* LOW-SPECIFICITY THREONINE ALDOLASE (EC 4\_1\_2\_5)
- 4\_1\_3\_1 7359 *Yersinia pseudotuberculosis* EC-aceA ISOCITRATE LYASE (EC 4\_1\_3\_1)
- 4\_1\_3\_12 4182 *Yersinia pseudotuberculosis* EC-leuA 2-ISOPROPYLMALATE SYNTHASE (EC 4\_1\_3\_12)
- 4\_1\_3\_16 6410 *Yersinia pseudotuberculosis* 4-HYDROXY-2-OXOGLUTARATE ALDOLASE (EC 4\_1\_3\_16) / 2-DEHYDRO-3-DEOXYPHOSPHOGLUCONATE ALDOLASE (EC 4\_1\_2\_14)
- 4\_1\_3\_19 1019 *Treponema pallidum* TP0562 N-ACETYLNEURAMINATE SYNTHASE (EC 4\_1\_3\_19)
- 4\_1\_3\_2 7360 *Yersinia pseudotuberculosis* EC-aceB MALATE SYNTHASE A (EC 4\_1\_3\_2)
- 4\_1\_3\_21 1649 *Clostridium acetobutylicum* 4775328\_C2\_27 HOMOCITRATE SYNTHASE, OMEGA SUBUNIT (EC 4\_1\_3\_21)
- 4\_1\_3\_27 199 *Yersinia pseudotuberculosis* EC-trpE ANTHRANILATE SYNTHASE COMPONENT I (EC 4\_1\_3\_27)
- 4\_1\_3\_3 6064 *Yersinia pseudotuberculosis* EC-nanA N-ACETYLNEURAMINATE LYASE SUBUNIT (EC 4\_1\_3\_3)
- 4\_1\_3\_30 5161 *Vibrio cholerae* El Tor N16961 ORF01725 methylisocitrate lyase (EC 4\_1\_3\_30)

4\_1\_3\_31 119 *Yersinia pestis* EC-gltA 2-methylcitrate synthase (EC 4\_1\_3\_31)  
 4\_1\_3\_34 287 *Streptococcus pyogenes* citE CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6) / CITRYL-COA LYASE SUBUNIT (EC 4\_1\_3\_34)  
 4\_1\_3\_36 8098 *Yersinia pseudotuberculosis* EC-menB NAPHTHOATE SYNTHASE (EC 4\_1\_3\_36)  
 4\_1\_3\_6 6671 *Yersinia pseudotuberculosis* CITRATE LYASE BETA CHAIN (EC 4\_1\_3\_6)  
 4\_1\_3\_7 4686 *Yersinia pseudotuberculosis* EC-gltA CITRATE SYNTHASE (EC 4\_1\_3\_7)  
 4\_1\_99\_1 522 *Vibrio cholerae* El Tor N16961ORFA01101 TRYPTOPHANASE (EC 4\_1\_99\_1)  
 4\_1\_99\_2 456 *Porphyromonas gingivalis* TYROSINE PHENOL-LYASE (EC 4\_1\_99\_2)  
 4\_1\_99\_4 7712 *Yersinia pseudotuberculosis* PUTATIVE 1-AMINOCYCLOPROPANE-1-CARBOXYLATE DEAMINASE (EC 4\_1\_99\_4)  
 4\_2\_1\_10 7491 *Yersinia pseudotuberculosis* BS-yqhS 3-DEHYDROQUINATE DEHYDRATASE (EC 4\_2\_1\_10)  
 4\_2\_1\_12 6871 *Yersinia pseudotuberculosis* PHOSPHOGLUCONATE DEHYDRATASE (EC 4\_2\_1\_12)  
 4\_2\_1\_14 7381 *Vibrio cholerae* El Tor N16961ORFA00608 D-SERINE DEHYDRATASE (EC 4\_2\_1\_14)  
 4\_2\_1\_16 4837 *Yersinia pseudotuberculosis* THREONINE DEHYDRATASE BIOSYNTHETIC PRECURSOR (EC 4\_2\_1\_16)  
 4\_2\_1\_19 6125 *Yersinia pseudotuberculosis* EC-hisB IMIDAZOLEGLYCEROL-PHOSPHATE DEHYDRATASE (EC 4\_2\_1\_19)  
 4\_2\_1\_20 6460 *Yersinia pseudotuberculosis* EC-trpA TRYPTOPHAN SYNTHASE ALPHA CHAIN (EC 4\_2\_1\_20)  
 4\_2\_1\_28 42 *Salmonella typhimurium*trjO31041 DIOL DEHYDRASE (DIOL DEHYDRATASE) BETA SUBUNIT (EC 4\_2\_1\_28)  
 4\_2\_1\_30 44 *Salmonella typhimurium* GLYCEROL DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_30)  
 4\_2\_1\_32 2959 *Salmonella typhimurium* ttdA L(+)-TARTRATE DEHYDRATASE ALPHA SUBUNIT (EC 4\_2\_1\_32)  
 4\_2\_1\_33 5771 *Yersinia pseudotuberculosis* EC-leuC 3-ISOPROPYLMALATE DEHYDRATASE LARGE SUBUNIT (EC 4\_2\_1\_33)  
 4\_2\_1\_40 2793 *Salmonella typhimurium* GLUCARATE DEHYDRATASE SUBUNIT (EC 4\_2\_1\_40)  
 4\_2\_1\_41 247 *Bacillus subtilis* ycbC 5-DEHYDRO-4-DEOXYGLUCARATE DEHYDRATASE (EC 4\_2\_1\_41)  
 4\_2\_1\_42 4594 *Salmonella typhimurium* yhaG D-GALACTARATE DEHYDRATASE (EC 4\_2\_1\_42)  
 4\_2\_1\_45 9 *Yersinia pseudotuberculosis* BS-yfmG CDP-GLUCOSE 4,6-DEHYDRATASE (EC 4\_2\_1\_45)  
 4\_2\_1\_49 5599 *Yersinia pseudotuberculosis* UROCANATE HYDRATASE (EC 4\_2\_1\_49)  
 4\_2\_1\_51 6915 *Yersinia pseudotuberculosis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) / PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 4\_2\_1\_52 5705 *Yersinia pseudotuberculosis* EC-dapA DIHYDRODIPICOLINATE SYNTHASE (EC 4\_2\_1\_52)  
 4\_2\_1\_55 3151 *Pseudomonas aeruginosa* PA2767 3-HYDROXBUTYRYL-COA DEHYDRATASE (EC 4\_2\_1\_55)  
 4\_2\_1\_6 5846 *Salmonella typhimurium* GALACTONATE DEHYDRATASE (EC 4\_2\_1\_6)  
 4\_2\_1\_60 151 *Yersinia pestis* 3-HYDROXYDECANOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_60)  
 4\_2\_1\_61 47 *Saccharomyces cerevisiae* FAS1 FATTY ACID SYNTHASE, SUBUNIT BETA (EC 2\_3\_1\_86) [INCLUDES: 3- HYDROXYPALMITOYL-[ACYL-CARRIER-PROTEIN] DEHYDRATASE (EC 4\_2\_1\_61); ENOYL-[ACYL-CARRIER-PROTEIN] REDUCTASE [NADH] (EC 1\_3\_1\_9); [ACYL-CARRIER-PROTEIN] ACETYLTRANSFERASE (EC 2\_3\_1\_38); [ACYL-CARRIER-PROTEIN] MALONYLTRANSFERASE (EC 2\_3\_1\_39); S-ACYL FATTY ACID SYNTHASE THIOESTERASE (EC 3\_1\_2\_14)]  
 4\_2\_1\_7 5291 *Yersinia pseudotuberculosis* EC-uxaA ALTRONATE HYDROLASE (EC 4\_2\_1\_7)  
 4\_2\_1\_8 4452 *Yersinia pseudotuberculosis* EC-uxuA MANNONATE DEHYDRATASE (EC 4\_2\_1\_8)  
 4\_2\_1\_84 560 *Mycobacterium tuberculosis* Rv0106 NITRILE HYDRATASE SUBUNIT BETA (EC 4\_2\_1\_84)  
 4\_2\_1\_89 3943 *Salmonella typhimurium* caiB L-CARNITINE DEHYDRATASE (EC 4\_2\_1\_89)  
 4\_2\_1\_9 8029 *Yersinia pseudotuberculosis* EC-ilvD DIHYDROXY-ACID DEHYDRATASE (EC 4\_2\_1\_9)  
 4\_2\_1\_90 5362 *Escherichia coli* b2247 L-rhamnonate dehydratase (EC 4\_2\_1\_90)  
 4\_2\_2\_1 959 *Streptococcus pyogenes* hylA HYALURONATE LYASE PRECURSOR (EC 4\_2\_2\_1)  
 4\_2\_2\_10 1863 *Bacillus subtilis* pelB PECTIN LYASE (EC 4\_2\_2\_10)  
 4\_2\_2\_2 72 *Yersinia pseudotuberculosis* PERIPLASMIC PECTATE LYASE PRECURSOR (EC 4\_2\_2\_2)  
 4\_2\_2\_3 1653 *Pseudomonas aeruginosa* algL ALGINATE LYASE PRECURSOR (EC 4\_2\_2\_3)  
 4\_2\_2\_6 3752 *Yersinia pestis* OLIGOGALACTURONATE LYASE (EC 4\_2\_2\_6)

4\_2\_2\_9 7092 *Yersinia pseudotuberculosis* EXOPOLY GALACTURONATE LYASE (EC 4\_2\_2\_9)  
 4\_2\_99\_10 1236 *Streptococcus pneumoniae* O-ACETYLHOMOSERINE SULFHYDRYLASE (EC  
 4\_2\_99\_10) / O-ACETYL SERINE SULFHYDRYLASE (EC 4\_2\_99\_8)  
 4\_2\_99\_11 6467 *Yersinia pseudotuberculosis* EC-yccG METHYLGLYOXAL SYNTHASE (EC 4\_2\_99\_11)  
 4\_2\_99\_2 7399 *Yersinia pseudotuberculosis* THREONINE SYNTHASE (EC 4\_2\_99\_2)  
 4\_2\_99\_8 5928 *Yersinia pseudotuberculosis* CYSTEINE SYNTHASE A (EC 4\_2\_99\_8)  
 4\_2\_99\_9 6531 *Yersinia pseudotuberculosis* EC-metB CYSTATHIONINE GAMMA-SYNTHASE (EC  
 4\_2\_99\_9)  
 4\_3\_1\_1 6333 *Yersinia pseudotuberculosis* EC-aspa ASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_1)  
 4\_3\_1\_12 7087 *Yersinia pseudotuberculosis* ORNITHINE CYCLODEAMINASE (EC 4\_3\_1\_12)  
 4\_3\_1\_15 7921 *Bordetella bronchiseptica* PUTATIVE DIAMINOPROPIONATE AMMONIA-LYASE  
 (EC 4\_3\_1\_15)  
 4\_3\_1\_2 3034 *Bordetella pertussis* METHYLASPARTATE AMMONIA-LYASE (EC 4\_3\_1\_2)  
 4\_3\_1\_5 6294 *Salmonella paratyphi* PHENYLALANINE AMMONIA-LYASE (EC 4\_3\_1\_5)  
 4\_3\_1\_7 1085 *Salmonella typhimurium* eutC ETHANOLAMINE AMMONIA-LYASE LIGHT CHAIN (EC  
 4\_3\_1\_7)  
 4\_3\_99\_1 2083 *Pseudomonas aeruginosa* cynS CYANATE LYASE (EC 4\_3\_99\_1)  
 4\_4\_1\_11 1209 *Porphyromonas gingivalis* METHIONINE GAMMA-LYASE (EC 4\_4\_1\_11)  
 4\_4\_1\_8 4224 *Yersinia pseudotuberculosis* EC-metC CYSTATHIONINE BETA-LYASE (EC 4\_4\_1\_8)  
 4\_6\_1\_3 4442 *Yersinia pseudotuberculosis* 3-DEHYDROQUINATE SYNTHASE (EC 4\_6\_1\_3)  
 4\_6\_1\_4 7968 *Yersinia pseudotuberculosis* EC-aroC CHORISMATE SYNTHASE (EC 4\_6\_1\_4)  
 5\_1\_1\_1 5426 *Yersinia pseudotuberculosis* BS-yncD ALANINE RACEMASE, BIOSYNTHETIC (EC  
 5\_1\_1\_1)  
 5\_1\_1\_13 6593 *Yersinia pseudotuberculosis* EC-ygeA ASPARTATE RACEMASE (EC 5\_1\_1\_13)  
 5\_1\_1\_3 7651 *Yersinia pseudotuberculosis* EC-murI GLUTAMATE RACEMASE (EC 5\_1\_1\_3)  
 5\_1\_1\_4 352 *Pseudomonas aeruginosa* PA1268 PROLINE RACEMASE (EC 5\_1\_1\_4)  
 5\_1\_1\_7 7986 *Yersinia pseudotuberculosis* EC-dapF DIAMINOPIMELATE EPIMERASE (EC 5\_1\_1\_7)  
 5\_1\_2\_2 5250 *Salmonella typhimurium* yfaW MANDELATE RACEMASE (EC 5\_1\_2\_2)  
 5\_1\_2\_3 6205 *Yersinia pseudotuberculosis* EC-fadB FATTY OXIDATION COMPLEX ALPHA SUBUNIT  
 [INCLUDES: ENOYL-COA HYDRATASE (EC 4\_2\_1\_17); DELTA(3)-CIS-DELTA(2)-TRANS-ENOYL-COA  
 ISOMERASE (EC 5\_3\_3\_8); 3-HYDROXYACYL-COA DEHYDROGENASE (EC 1\_1\_1\_35); 3-  
 HYDROXYBUTYRYL-COA EPIMERASE (EC 5\_1\_2\_3)]  
 5\_1\_3\_13 1391 *Streptococcus pyogenes* cpsFP DTD-4-DEHYDRORHAMNOSE 3,5-EPIMERASE (EC  
 5\_1\_3\_13)  
 5\_1\_3\_20 7704 *Yersinia pseudotuberculosis* EC-rfaD ADP-L-GLYCERO-D-MANNO-HEPTOSE-6-  
 EPIMERASE (EC 5\_1\_3\_20)  
 5\_1\_3\_4 6515 *Yersinia pseudotuberculosis* BS-araD L-RIBULOSE-5-PHOSPHATE 4-EPIMERASE (EC  
 5\_1\_3\_4)  
 5\_1\_3\_6 4833 *Klebsiella pneumoniae* UDP-GLUCURONATE 4-EPIMERASE (EC 5\_1\_3\_6)  
 5\_1\_3\_9 4177 *Yersinia pseudotuberculosis* N-acetylmannosamine-6-phosphate 2-epimerase (EC 5\_1\_3\_9)  
 5\_2\_1\_1 165 *Bordetella pertussis* MALEATE CIS-TRANS ISOMERASE (EC 5\_2\_1\_1)  
 5\_2\_1\_4 5172 *Vibrio cholerae* El Tor N16961 ORF01738 MALEYLPYRUVATE ISOMERASE (EC 5\_2\_1\_4)  
 5\_3\_1\_12 7695 *Yersinia pseudotuberculosis* EC-uxaC URONATE ISOMERASE (EC 5\_3\_1\_12)  
 5\_3\_1\_14 7797 *Yersinia pseudotuberculosis* EC-rhaA L-RHAMNOSE ISOMERASE (EC 5\_3\_1\_14)  
 5\_3\_1\_16 6123 *Yersinia pseudotuberculosis* EC-hisA PHOSPHORIBOSYLFORMIMINO-5-  
 AMINOIMIDAZOLE CARBOXAMIDE RIBOTIDE ISOMERASE (EC 5\_3\_1\_16)  
 5\_3\_1\_17 4840 *Yersinia pestis* EC-kduI 4-DEOXY-L-THREO-5-HEXOSULOSE-URONATE KETOL-  
 ISOMERASE (EC 5\_3\_1\_17)  
 5\_3\_1\_22 7681 *Yersinia pseudotuberculosis* HYDROXYPYRUVATE ISOMERASE (EC 5\_3\_1\_22)  
 5\_3\_1\_24 6735 *Yersinia pseudotuberculosis* EC-trpC INDOLE-3-GLYCEROL PHOSPHATE SYNTHASE (EC  
 4\_1\_1\_48) / N-(5'-PHOSPHO-RIBOSYL)ANTHRANILATE ISOMERASE (EC 5\_3\_1\_24)  
 5\_3\_1\_25 1535 *Streptococcus pneumoniae* EC-fucI L-FUCOSE ISOMERASE (EC 5\_3\_1\_25)  
 5\_3\_1\_26 974 *Yersinia pestis* GALACTOSE-6-PHOSPHATE ISOMERASE LACB SUBUNIT (EC  
 5\_3\_1\_26)  
 5\_3\_1\_4 7514 *Yersinia pseudotuberculosis* EC-araA L-ARABINOSE ISOMERASE (EC 5\_3\_1\_4)  
 5\_3\_1\_5 6147 *Yersinia pseudotuberculosis* EC-xyIA XYLOSE ISOMERASE (EC 5\_3\_1\_5)  
 5\_3\_3\_10 3943 *Yersinia pestis* 5-CARBOXYMETHYL-2-HYDROXYMUCONATE DELTA-  
 ISOMERASE (EC 5\_3\_3\_10)  
 5\_3\_3\_4 311 *Pseudomonas aeruginosa* catC MUCONOLACTONE ISOMERASE (EC 5\_3\_3\_4)  
 5\_4\_1\_2 969 *Salmonella typhimurium* cbiC PRECORRIN-8X METHYLMUTASE (EC 5\_4\_1\_2)  
 5\_4\_2\_3 5499 *Yersinia pseudotuberculosis* EC-mrsA PHOSPHOGLUCOSAMINE MUTASE (EC 5\_4\_2\_-) /  
 PHOSPHOACETYLGLUCOSAMINE MUTASE (EC 5\_4\_2\_3) / PHOSPHOMANNOMUTASE (EC 5\_4\_2\_8)

5\_4\_2\_6 963 *Neisseria gonorrhoeae* BS-yvdM BETA-PHOSPHOGLUCOMUTASE (EC 5\_4\_2\_6)  
 5\_4\_2\_7 7525 *Yersinia pseudotuberculosis* EC-deoB PHOSPHOPENTOMUTASE (EC 5\_4\_2\_7)  
 5\_4\_2\_9 7116 *Bordetella bronchiseptica* PHOSPHOENOLPYRUVATE PHOSPHOMUTASE  
 PRECURSOR (EC 5\_4\_2\_9)  
 5\_4\_3\_2 6168 *Yersinia pseudotuberculosis* EC-yjeK L-LYSINE 2,3-AMINOMUTASE (EC 5\_4\_3\_2)  
 5\_4\_3\_3 1523 *Porphyromonas gingivalis* D-LYSINE 5,6-AMINOMUTASE BETA SUBUNIT (EC  
 5\_4\_3\_3)  
 5\_4\_3\_8 6619 *Yersinia pseudotuberculosis* EC-hemL GLUTAMATE-1-SEMIALDEHYDE 2,1-  
 AMINOMUTASE (EC 5\_4\_3\_8)  
 5\_4\_99\_16 1514 *Salmonella typhimurium* MALTOOLIGOSYLTREHALOSE SYNTHASE (EC  
 5\_4\_99\_16)  
 5\_4\_99\_5 6915 *Yersinia pseudotuberculosis* EC-pheA CHORISMATE MUTASE (EC 5\_4\_99\_5) /  
 PREPHENATE DEHYDRATASE (EC 4\_2\_1\_51)  
 5\_4\_99\_6 8095 *Yersinia pseudotuberculosis* EC-menF MENAQUINONE-SPECIFIC ISOCHORISMATE  
 SYNTHASE (EC 5\_4\_99\_6)  
 5\_4\_99\_9 5269 *Salmonella typhimurium* UDP-GALACTOPYRANOSE MUTASE (EC 5\_4\_99\_9)  
 5\_5\_1\_1 310 *Pseudomonas aeruginosa* catB MUCONATE CYCLOISOMERASE (EC 5\_5\_1\_1)  
 5\_5\_1\_2 2128 *Pseudomonas aeruginosa* pcaB 3-CARBOXY-CIS,CIS-MUCONATE CYCLOISOMERASE  
 (EC 5\_5\_1\_2)  
 5\_5\_1\_5 7814 *Yersinia pseudotuberculosis* EC-ybhE CARBOXY-CIS,CIS-MUCONATE CYCLASE (EC  
 5\_5\_1\_5)  
 5\_5\_1\_7 7476 *Yersinia pseudotuberculosis* BS-ykfB CHLOROMUCONATE CYCLOISOMERASE (EC  
 5\_5\_1\_7)  
 6\_2\_1\_12 8479 *Pseudomonas aeruginosa* PA3860 4-COUMARATE--COA LIGASE 2 (EC 6\_2\_1\_12)  
 6\_2\_1\_14 6490 *Yersinia pseudotuberculosis* 6-CARBOXYHEXANOATE--COA LIGASE (EC 6\_2\_1\_14)  
 6\_2\_1\_17 5165 *Vibrio cholerae* El Tor N16961 ORF01729 propionate--CoA ligase (EC 6\_2\_1\_17)  
 6\_2\_1\_21 1358 *Escherichia coli* b1398 phenylacetate--CoA ligase (EC 6\_2\_1\_21)  
 6\_2\_1\_22 4651 *Vibrio cholerae* El Tor N16961 ORF01068 [CITRATE (PRO-3S)-LYASE] LIGASE (EC  
 6\_2\_1\_22)  
 6\_2\_1\_25 538 *Mycobacterium tuberculosis* fadD22 BENZOATE-COENZYME A LIGASE (EC 6\_2\_1\_25)  
 6\_2\_1\_26 8100 *Yersinia pseudotuberculosis* EC-menE O-SUCCINYLBENZOIC ACID--COA LIGASE (EC  
 6\_2\_1\_26)  
 6\_2\_1\_5 5649 *Yersinia pseudotuberculosis* EC-sucC SUCCINYL-COA SYNTHETASE BETA CHAIN (EC  
 6\_2\_1\_5)  
 6\_2\_1\_6 4151 *Pseudomonas aeruginosa* PA1188 GLUTARATE--COA LIGASE (EC 6\_2\_1\_6)  
 6\_2\_1\_8 5444 *Escherichia coli* b2371 FORMATE--COA LIGASE (EC 6\_2\_1\_8)  
 6\_3\_1\_1 5949 *Yersinia pseudotuberculosis* EC-asnA ASPARTATE--AMMONIA LIGASE (EC 6\_3\_1\_1)  
 6\_3\_1\_8 6658 *Salmonella typhimurium* gsp BIFUNCTIONAL GLUTATHIONYLSPERMIDINE  
 SYNTHETASE/AMIDASE [INCLUDES: GLUTATHIONYLSPERMIDINE SYNTHASE (EC 6\_3\_1\_8) /  
 GLUTATHIONYLSPERMIDINE AMIDASE (EC 3\_5\_1\_78)]  
 6\_3\_2\_1 7187 *Yersinia pseudotuberculosis* EC-panC PANTOATE--BETA-ALANINE LIGASE (EC 6\_3\_2\_1)  
 6\_3\_2\_12 5479 *Yersinia pseudotuberculosis* FOLYLPOLYGLUTAMATE SYNTHASE (EC 6\_3\_2\_17) /  
 DIHYDROFOLATE SYNTHASE (EC 6\_3\_2\_12)  
 6\_3\_2\_13 5376 *Yersinia pseudotuberculosis* EC-murE UDP-N-ACETYLMURAMOYLALANYL-D-  
 GLUTAMATE--2,6-DIAMINOPIMELATE LIGASE (EC 6\_3\_2\_13)  
 6\_3\_2\_15 5375 *Yersinia pseudotuberculosis* EC-murF UDP-N-ACETYLMURAMOYLALANYL-D-  
 GLUTAMYL-2,6-DIAMINOPIMELATE--D-ALANYL-D- ALANYL LIGASE (EC 6\_3\_2\_15)  
 6\_3\_2\_4 7935 *Yersinia pseudotuberculosis* EC-ddlB D-ALANINE--D-ALANINE LIGASE (EC 6\_3\_2\_4)  
 6\_3\_2\_5 6572 *Yersinia pseudotuberculosis* BS-yloI PHOSPHOPANTOTHENATE--CYSTEINE LIGASE (EC  
 6\_3\_2\_5) / PHOSPHOPANTOTHENOYL-CYSTEINE DECARBOXYLASE (EC 4\_1\_1\_36)  
 6\_3\_2\_8 7936 *Yersinia pseudotuberculosis* EC-murC UDP-N-ACETYLMURAMATE--ALANINE LIGASE  
 (EC 6\_3\_2\_8)  
 6\_3\_2\_9 7939 *Yersinia pseudotuberculosis* EC-murD UDP-N-ACETYLMURAMOYLALANINE--D-  
 GLUTAMATE LIGASE (EC 6\_3\_2\_9)  
 6\_3\_3\_3 4728 *Yersinia pseudotuberculosis* DETHIOBIOTIN SYNTHETASE (EC 6\_3\_3\_3)  
 6\_3\_4\_6 4285 *Yersinia pseudotuberculosis* BS-ycsJ UREA CARBOXYLASE (EC 6\_3\_4\_6) /  
 ALLOPHANATE HYDROLASE (EC 3\_5\_1\_54)



Figure 8

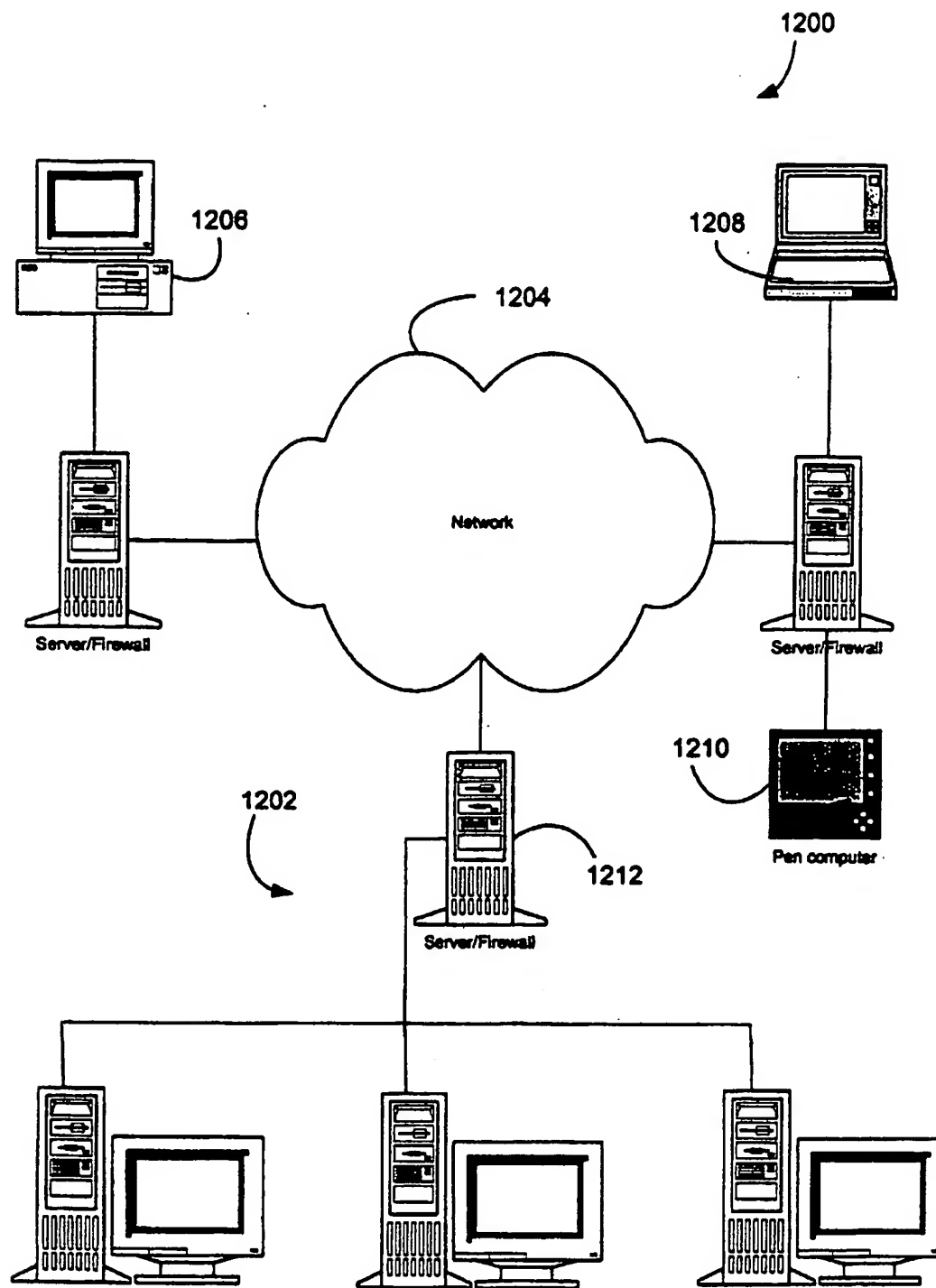
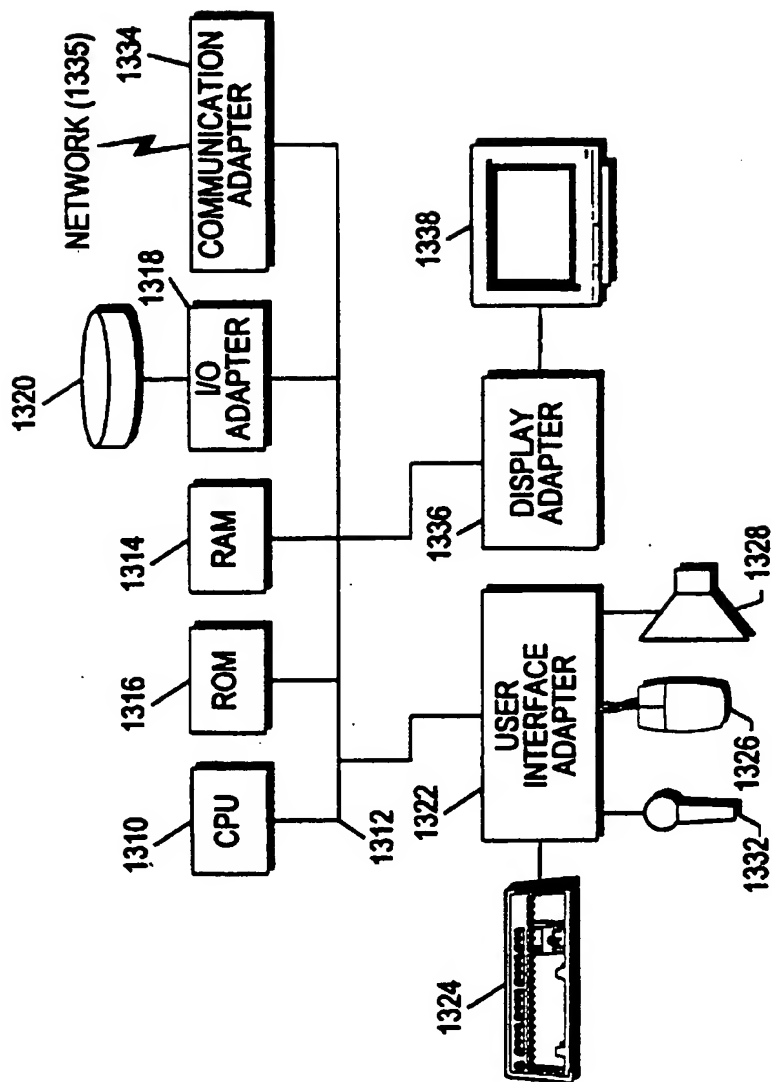
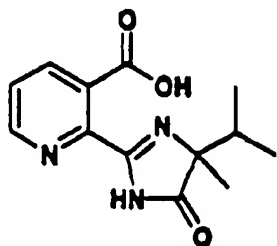
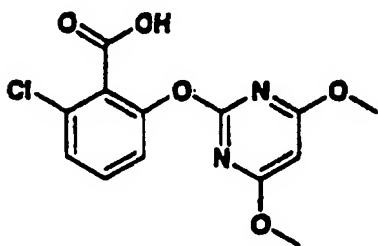
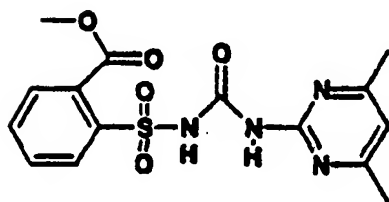
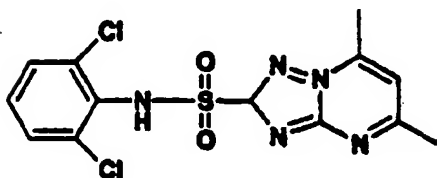
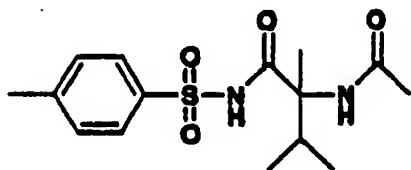


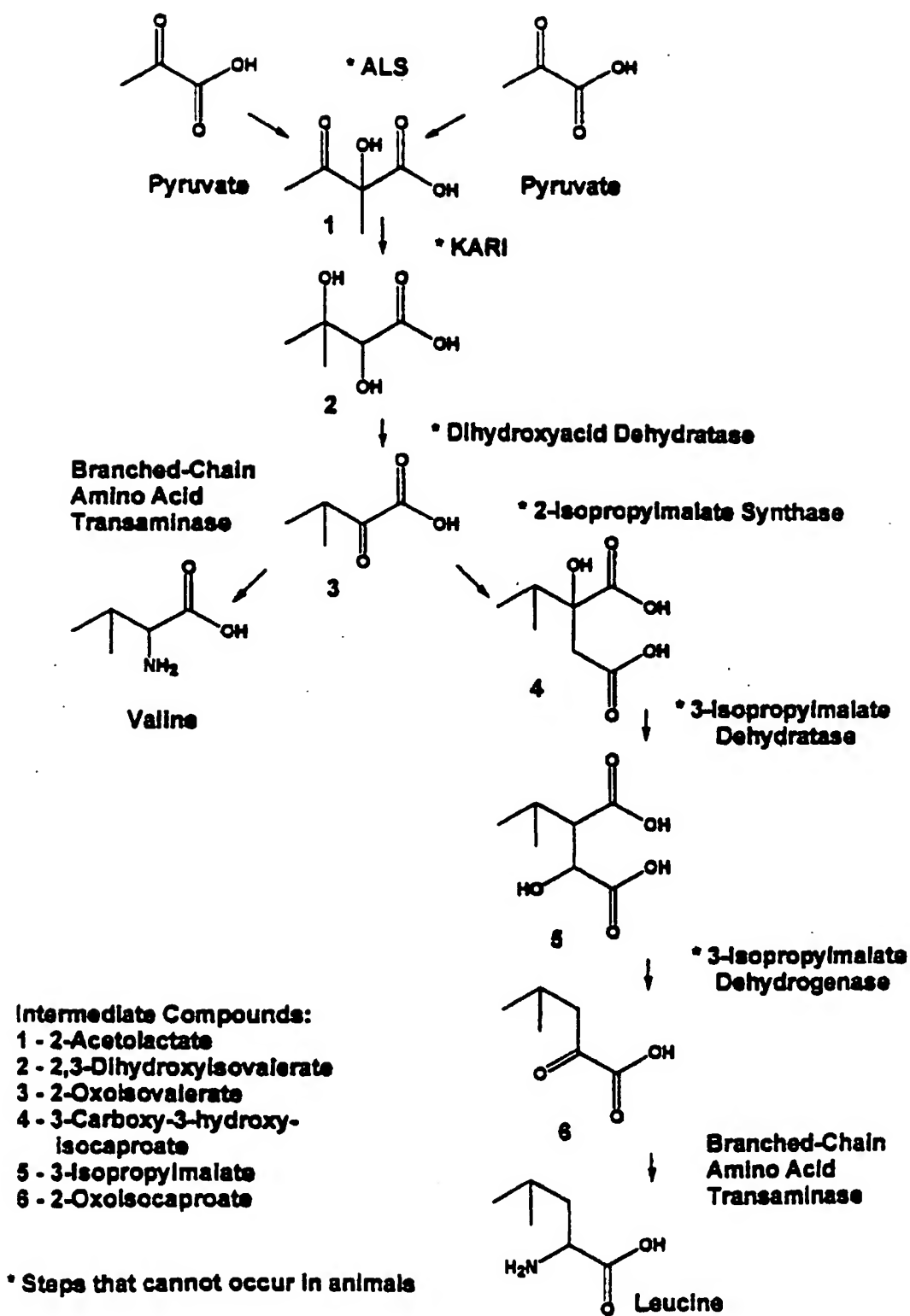
Figure 9



*Figure 10***Imidazolinone****Pyrimidyl-oxy-benzoic acid****Sulfonylurea****Triazolopyrimidine****Sulfonylcarboxamide**

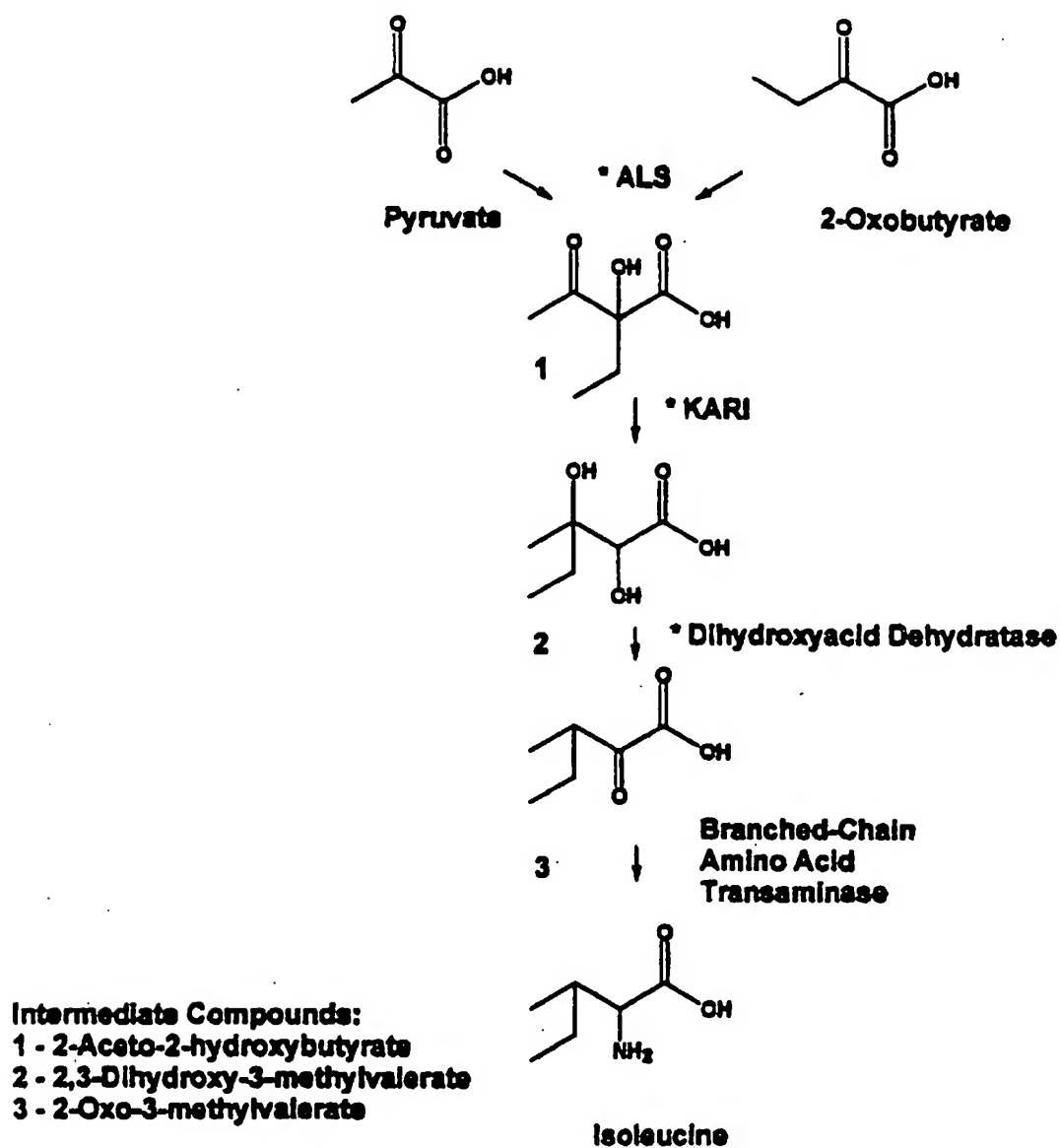
Compounds representing different chemical classes of AcLS inhibitors, and which are currently used as herbicides.

Figure 11



Branched-chain amino acid pathway. Synthesis of Valine and Leucine.

Figure 12



\*Enzyme activities not described in humans

Branched-chain amino acid pathway. Synthesis of Isoleucine.

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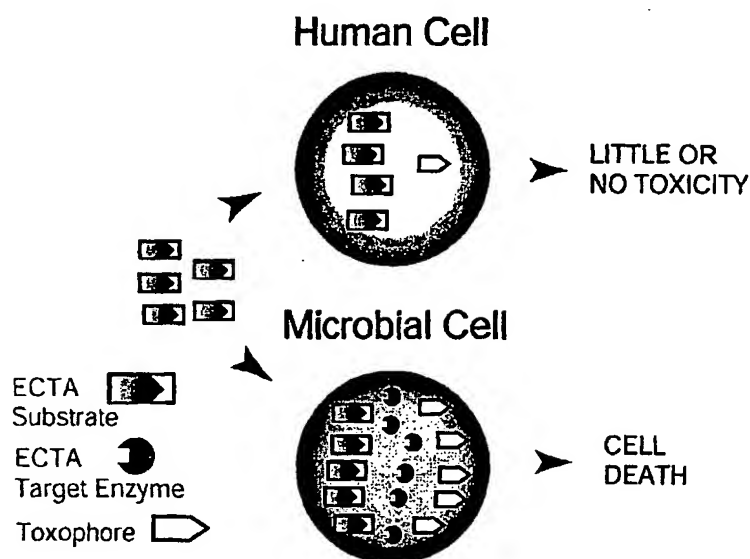
(74) Agent: **KONSKI, Antoinette, F.**; McCutchen, Doyle, Brown & Enerson, LLP, Three Embarcadero Center, San Francisco, CA 94111 (US).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

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[Continued on next page]

(54) Title: METHODS FOR IDENTIFYING THERAPEUTIC TARGETS



#### ENZYME CATALYZED THERAPEUTIC ACTIVATION

*ECTA technology utilizes preferentially expressed enzymes in pathogenic organisms to generate cytotoxins.*

(57) Abstract: This invention provides methods and systems to identify enzymes that act as enzyme catalyzed therapeutic activators and the enzymes identified by these methods. Also provided by this invention are compounds activated by the enzymes as well as compositions containing these compounds.

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CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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20 February 2003

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 A61K49/00 , A61K47/48

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

CHEM ABS Data, EMBASE, BIOSIS, EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 99 37753 A (GROZIAK MICHAEL P ;SHEPARD H MICHAEL (US); NEWBIOTICS INC (US)) 29 July 1999 (1999-07-29) claims ---	1-81
X	WO 99 08110 A (SHEPARD H MICHAEL ;NEWBIOTICS INC (US)) 18 February 1999 (1999-02-18) claims --- -/--	1-15

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.**\* Special categories of cited documents :**

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search

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## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	SMYTH, TIMOTHY P. ET AL: "S-Aminosulfeniminopenicillins: Multimode. beta.- Lactamase Inhibitors and Template Structures for Penicillin-Based. beta.- Lactamase Substrates as Prodrugs" JOURNAL OF ORGANIC CHEMISTRY (1998), 63(22), 7600-7618 , XP002204183 abstract	1-15
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P,X	WO 01 64687 A (CATHERS BRIAN EDWIN ;SHEPARD H MICHAEL (US); CHAN MING FAI (US); L) 7 September 2001 (2001-09-07) claims	1-15
P,X	WO 01 83492 A (CHAN MING FAI ;LI QING (US); LOBL THOMAS J (US); NEWBIOTICS INC (U) 8 November 2001 (2001-11-08) claims	1-15
P,X	WO 01 07088 A (SHEPARD H MICHAEL ;NEWBIOTICS INC (US)) 1 February 2001 (2001-02-01) claims	1-15
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-/--

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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P,Y	WO 01 07454 A (GROZIAK MICHAEL P ;SHEPARD H MICHAEL (US); CHAN MING FAI (US); NEW) 1 February 2001 (2001-02-01) claims 1,13-34,37	1-15

# INTERNATIONAL SEARCH REPORT

ational application No.  
PCT/US 01/23095

## Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:  
see FURTHER INFORMATION sheet PCT/ISA/210
2. ☒ Claims Nos.:  
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:  
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

## Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

### Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

## Continuation of Box I.1

Although claims 1-6, 68-81 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.

Although claims 7-59 are directed to a diagnostic method practised on the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.

## Continuation of Box I.2

Present claims 1-81 relate to an extremely large number of possible products or methods. In fact, the claims contain so many variables that a lack of clarity (and/or conciseness) within the meaning of Article 6 PCT arises to such an extent as to render a meaningful search of the claims impossible. Consequently, the search has been carried out for those parts of the application which do appear to be clear (and/or concise), namely products or methods have been searched which are recited in the examples.

The applicant's attention is drawn to the fact that claims, or parts of claims, relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure.

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